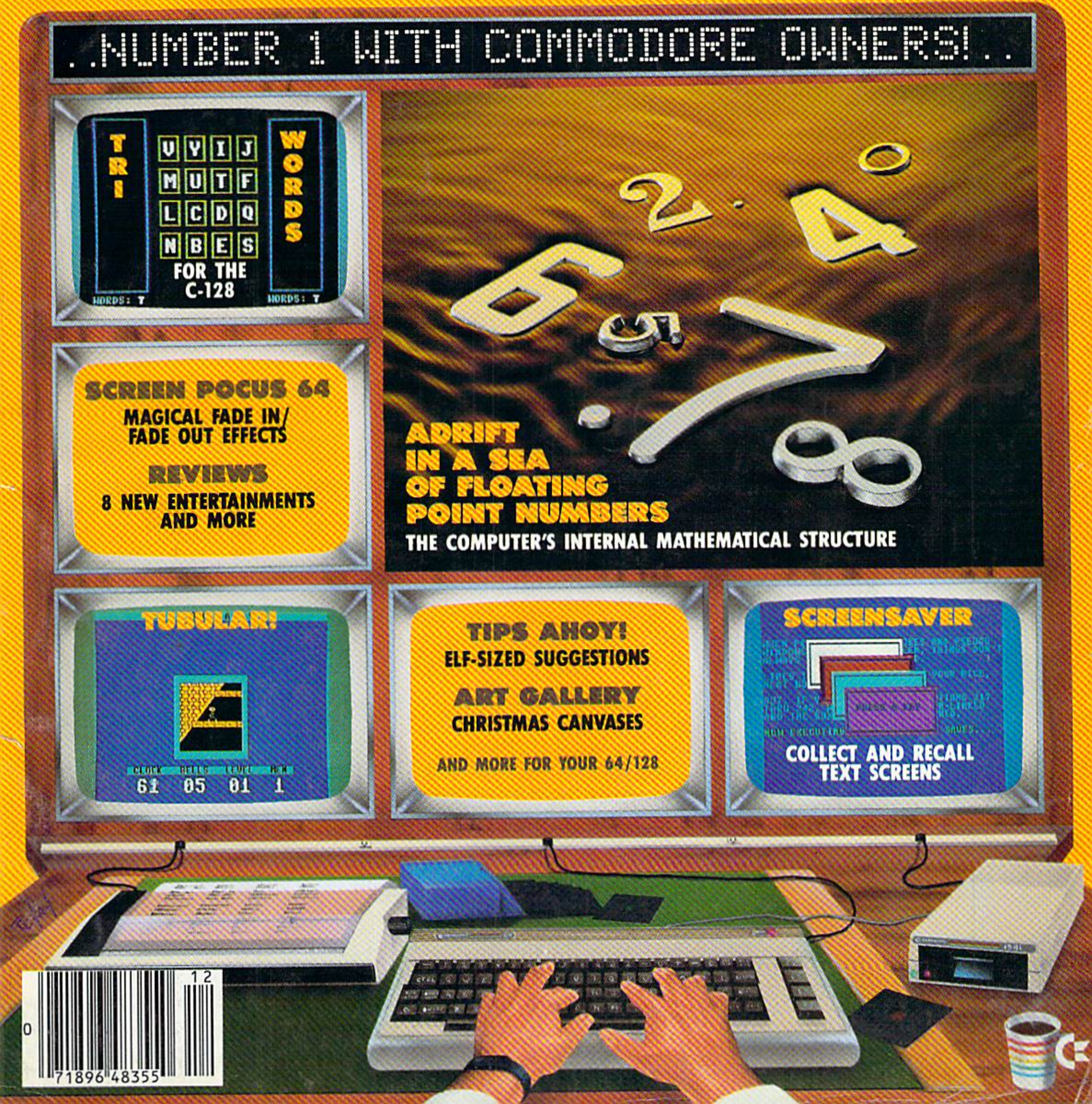
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Ahoy!

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DECEMBER 1988





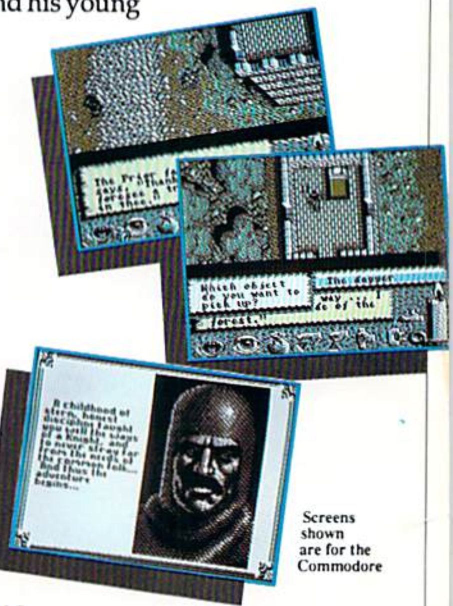
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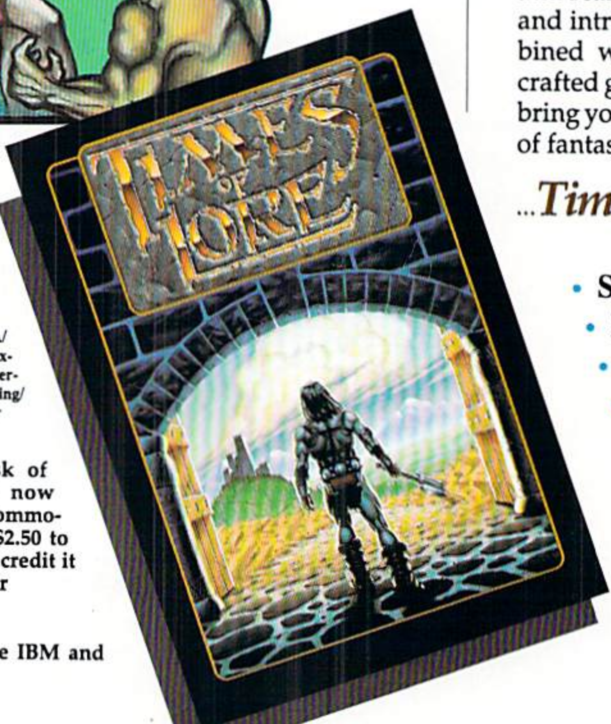
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SunRize Industries' *Color Splitter* allows *Digi-View* and *Perfect Vision* users to digitize color pictures from VCRs or color cameras without using color filters. As you can see in SunRize's ad on the inside back cover of this month's *Ahoy!'s AmigaUser*, it retails at $99.95. But *Ahoy!* Access Club members who order direct from SunRize **save 25%**—they pay only $75.00! For more information on the *Color Splitter*, or such other SunRize products as *Perfect Sound, Studio Magic*, or *Desktop Artist*, call 409-846-1311. (Offer expires December 31.)

SAVE 25%

Central Coast

Once again, Central Coast Software invites *Ahoy!* Access Club members who own the *Quarterback* hard disk backup utility to upgrade to version 2.0. (At press time, this upgrade offer was still **available exclusively through the *Clipper*.)** Send your original *QB* disk, along with this coupon and a check or money order for $15.00 (MC and VISA also accepted). For more information on *Quarterback* and other Central Coast products, see their ad on page 7 of this month's *Ahoy!'s AmigaUser*. (Offer good indefinitely.)

UPGRADE

Computer Repeats

Computer Repeats continues to offer a **20% higher trade-in allowance** to *Ahoy!* Access Club members. Nonmembers must buy hardware from Computer Repeats at the prices listed in the ad on page 55 of the December *Ahoy!* But *your* prices are:

Amiga 500: $199 with trade-in of your C-128 computer, 1571 drive, and 1902 monitor; or, $355 with your C-64 computer, 1541 drive, and 1702.

Commodore 128D: $209 with trade-in of your C-128 and 1571, or 64C computer, 1541 and 1702.

Amiga 2000: $1189 with trade-in of your Amiga 500.

Call 303-939-8144 for a price quote for your particular system. Mention your membership in the *Ahoy!* Access Club. Then, when you ship your equipment for trade-in, include this coupon. (Offer expires December 31.)

20% HIGHER TRADE-IN



P.A.V.Y. is repeating the offer made in October's *Clipper* on *Landmark, The Computer Reference Bible*. (See their ad on page 44 of this month's *Ahoy!)* Their special fall price on the $164.95 package is $129.95. But for *Ahoy!* Access Club members they're going **$10 lower**—to just $119.95 (plus $4.00 postage and handling). And that price, available to our members only, is the **lowest advertised anywhere**. (Offer expires December 31.)

$10 OFF



SOGWAP's *Big Blue Reader* programs allow you to transfer C-64/128 files to MS-DOS format, and vice versa. For full details, see SOGWAP's ad on page 29 of the December *Ahoy!* (or our review in the June '87 *Ahoy!*). *Ahoy!* Access Club members receive a **20% discount** on the price of both the 128 and 64 versions. The retail price of *Big Blue Reader 128* is $44.95; you pay $35.95. And while the rank and file pay $29.95 for *Big Blue Reader 64*, you pay $23.95. (Offer expires December 31.)

20% OFF

Creative Computers

Again this month, Creative Computers (see pages 10 and 11 of the December *Ahoy!'s AmigaUser)* is offering a discount on their entire line of Amiga products. With every order of $50 or more placed by an *Ahoy!* Access Club member, Creative Computers will extend a **5% discount**, and provide **free shipping** to anywhere in the Continental US. This offer is good on mail orders only; you must include this coupon; only one order per coupon is allowed; and you may not combine this offer with any other Creative Computers discount offer. For more information, call 213-370-2009. (Offer expires December 31.)

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The *RapiDOS* and *RapiDOS Professional* hardware modification kits let you turn your C-64 and 1541 into a high speed parallel disk operating system. If you've been plodding along at serial speed these many months (we *did tell* you about these products back in our April *Reviews* section), you can't make up for lost time. But if you buy *RapiDOS* or *RapiDOS Professional* now, Chip Level will throw in a **free *Parallel Utilities* disk—a regular $24.95 value!** The disk is essentially the same as Chip Level's *Mass Duplicator 1541* disk (see their ad on page 9 of this month's *Ahoy!*), with the addition of individual file copiers for use with *RapiDOS*. Include $3.00 for shipping with your payment of $49.95 for *RapiDOS* or $99.95 for *RapiDOS Professional*. (Offer expires December 31.)

FREE $25 DISK

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The FSD-2 Excelerator Plus disk drive is fully compatible with the C-64 or 64C, but offers a number of advantages over Commodore's 1541 and 1541C. The FSD-2 is a half-height drive, smaller and slimmer than the 1541/41C. It features a separate power supply, which allows it to remain cool. It is faster, quieter, and more reliable, and comes with a full one-year warranty. A guide light is available as an option. The price of the drive in Lyco's ad on pages 4 and 5 of the December *Ahoy!* is $149.95. But when *Ahoy!* Access Club members prepay (via check, money order, or credit card), they receive **free shipping**! (Offer expires December 31.)

FREE SHIPPING

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SPOC's ad on page 39 of this month's *Ahoy!'s AmigaUser* offers their disk of 35 family-oriented game and educational programs, plus a bonus disk containing samples from their library of public domain programs (reworked to run bug-free and without use of the CLI). The SPOCPD collection normally sells for $20.00; but *Ahoy!* Access Club members can obtain the entire collection for only $15.00. (Offer expires December 31.)

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Look for more bargains in the next edition of the *Clipper*, bound into subscriber copies of the January *Ahoy!* and *Ahoy!'s AmigaUser*.

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Ahoy!

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ISSUE NO. 60 DECEMBER 1988

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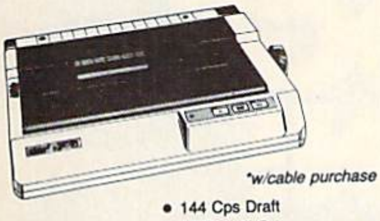
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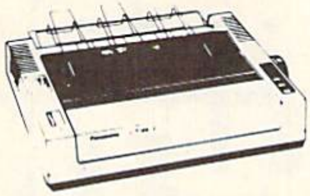
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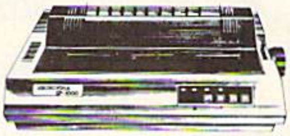
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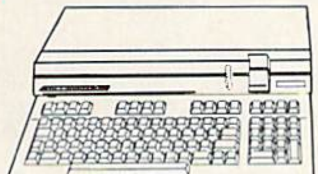
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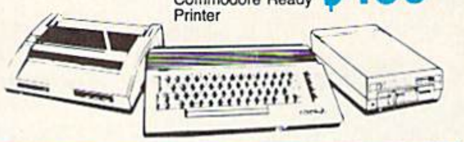
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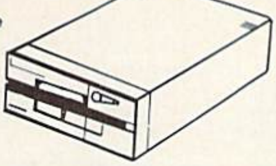
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VIEW FROM THE BRIDGE

This month it begins—the most exhaustive game software coverage you'll find in any 64/128 magazine, at any price! Entertainment Editor Arnie Katz and his staff have profiled no fewer than eight new entertainment packages for this issue—and just in time for Christmas shopping, too!

As we stressed last month, our expanded entertainment coverage is only a reflection of the scarcity of non-entertainment software on the market—not a sign of the "teching down" of *Ahoy!* We'll continue to tailor the magazine for the intermediate to advanced users who have always made up the bulk of our readership.

But the proof of the pudding is in the reading—of the December issue of *Ahoy!:*

• The odds are at least 1.70141183E+38 to 1 that you're annoyed by those strange numerical representations your computer resorts to when figures become too unwieldy to list. This month Dale Rupert explains why these types of numbers have a place in BASIC, along with offering a great deal more information. Once you've finished this issue's *Rupert Report,* you'll never again feel like you're *Adrift in a Sea of Floating Point Numbers.* (Turn to page 32.)

• For fans of Bob Blackmer's games, Christmas comes twice this month: both on the regularly scheduled date (December 7, isn't it?), and on receipt of this issue of *Ahoy!,* containing two Blackmer blockbusters. *Tri Words* is an electronic jumble contest for the C-128 which, the aforementioned author assures us, uses every three-letter word in his dictionary, excluding abbreviations and slang. (Turn to page 18.) *Tubular!* poses the problem of scaling a network of high pressure tubing to reach the top of a pyramid, scooping up 14 bells along the way. Bob himself has been unable to complete the 16th and highest level of the game. If anyone out there does (and we're sure someone out there will), let us hear from you—Bob is dying to know what happens! (Turn to page 18.)

• Just like us, you've probably wondered—how did Peter M.L. Lottrup come by those middle initials? Did he tack them on after he became a programmer? Did his parents make a lucky guess as to his future occupation? Or do they simply stand for something like Melvin Louis, rather than what we all feel they must? Unfortunately, we've had no opportunity to find out, since Peter sends his programs in from Buenos Aires, Argentina. One day, though, we'll spring for the long distance call to find out. In the meantime, there's no mystery about his *Screen Pocus 64* in this issue—its ability to fade text screens in and out is clearly of great value to programmers. (Turn to page 52.)

• Richard Curcio's innovative utilities have appeared in most of the leading Commodore periodicals. But now that he's joined our staff as Senior Editor, you can expect all his best work to appear in these pages. This month Rich offers a variation on one of his best. *Screensaver* provides C-64 users with pseudo-window capabilities approximating the real window capabilities of *TextSave* for the C-128 (January '88 *Ahoy!).* (Turn to page 55.)

• Members of the *Ahoy!* Access Club (consisting of subscribers to *Ahoy!* and *Ahoy!'s AmigaUser)* can take advantage of money saving offers from companies like Software Support, Lyco,Chip Level, SOGWAP, P.A.V.Y., Dune, and many others in this month's edition of the *Clipper.* The special monthly supplement is bound into subscription copies only. So if you haven't yet taken advantage of our discount subscription rates (see page 25), you now get to kick yourself harder than ever before!

We hope this issue of *Ahoy!* gives you nothing to kick about. If it does, we're only a letter or a phone call away.

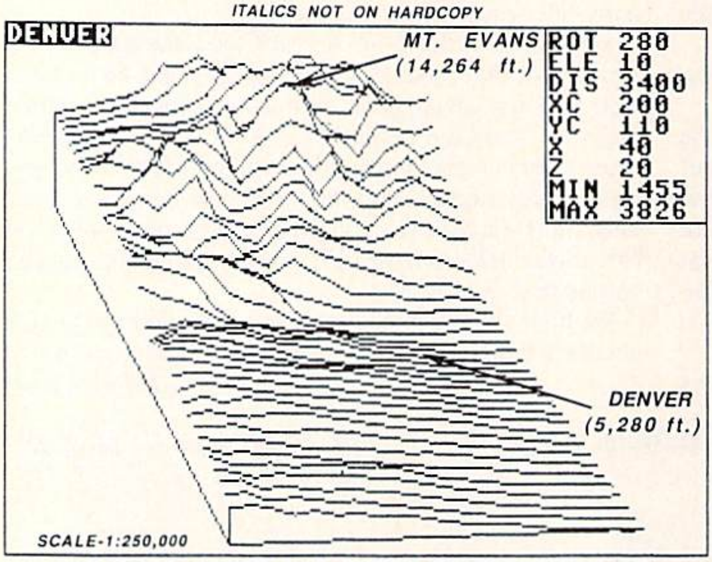
—David Allikas

SCUTTLEBUTT

CPU REPLACEMENT • COMPOSITION PROGRAM • PHONICS TUTOR • SWEEPSTAKES • TRAVEL PROGRAM • VIRUS HELP • GRAPHICS SHOW • BBS LEGAL PRIMER • C-64 FORTRAN • GEOGRAPHY PROGRAM • GAMES FROM ACCESS, DISCOVERY, ACCOLADE • 3-D GLASSES

ACTUAL DIGITAL LANDSCAPE PRINTOUT

ITALICS NOT ON HARDCOPY



518 MAPS COVER THE ENTIRE CONTERMINOUS U.S.

An area to be viewed on **Digital Landscape** *is loaded from one of five Elevation Disk sets, containing 414,000 elevations taken at regular intervals across the country.*

BBS LAW

SYSLAW: A Legal Guide for Sysops explains the legal rights and risks of bulletin board operators. The 100-page volume discusses the consequences of someone's posting copyrighted material on your board, your barring someone from using your BBS, the ramifications of charging users or accepting ads, and more. The book's authors are two attorneys with a knowledge of the subject: Jonathan Wallace is Assistant Sysop of CompuServe's Law Forum, Rees Morrison is a sysop on the American Bar Association's BBS, and together they run Lawyers Linked by Modem, a BBS for law-related material (212-766-3788). Price of the book is $19.00 plus $2.00 postage.

LLM Press, 212-766-3785 (see address list, page 14).
Circle #180 on Reader Service Card

FORTRAN TRAINING

With support for more than 45 statements and functions, *Fortran 64* ($39.95) offers an economical way to learn the language on the C-64. The built-in editor, compiler, and linker lets you create a fast stand-alone program which, when completed, can be run without Fortran. Subroutines and functions can be compiled separately from the main program, and input and output routines may be freeform or formatted. The user has access to the 6502 registers, Kernal, and machine language routines.

Abacus Software, 616-698-0330 (see address list, page 14).
Circle #181 on Reader Service Card

US IN 3-D

Digital Landscape lets the C-64 user view the topography of any area of the Continental US in 3-D. An area to be viewed is loaded from one of five separately available Elevation Disk sets, containing 414,000 elevations taken at regular intervals across the US.

Data taken from the Elevation Disks or entered through the keyboard can be used to produce 3-D renderings and horizontal or vertical cross-sections on the screen, with pertinent information displayed. Drawings can be rotated 360 degrees in one degree increments in azimuth and tilted from +1 degree to +89 degrees in declination. The scale of 3-D drawings can be varied, and vertical cross sections expanded and contracted vertically or horizontally.

The price of the *Digital Landscape* program disk, available in 5¼" or 3½" (1581) format, is $46.95. Each Elevation Disk set consists of two or three 5¼" disks and costs $29.95. All five sets can be purchased together for $99.95, or on three 3½" disks for $27.95 each.

Digiscape Software, 214-241-9891 (see address list, page 14).
Circle #182 on Reader Service Card

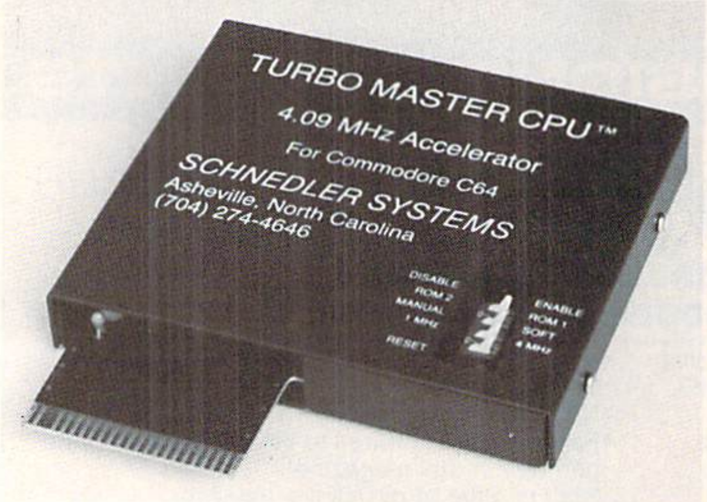
$100 IN FREE TIME

The Online Information Network (formerly the Instant Yellow Page Service) will give *Ahoy!* readers $100 in free usage if they mention *Ahoy!* The network makes it possible to compile custom mailing lists via dial-up access to three major databases consisting of 13 million business listings, 462,000 US manufacturers, and 3.9 million high-income customers. Charges are $1.00 per minute connect time plus 12¢ per record printed or displayed, as well as a $95 subscription fee for the first year (second year, $60).

Online Information Network, 402-593-4593 (see address list, page 14).
Circle #202 on Reader Service Card

SAT STUDY GUIDE

Simon & Schuster's Computer Study Guide for the SAT ($29.95) provides C-64 scholars with 25 practice modules of over 500 questions covering all the required areas of the Scholastic Aptitude Test, and two simulated exams. Included are a built-in optional timer, an automatic scoring device, a catalog of explanations for every question, an



The Turbo Master CPU Processor Accelerator increases the C-64's processing speed by four times. Also included are Turbo disk routines in ROM.

online scratch pad for computations, and test-taking strategies. An online calculator "locks out" during the two tests. Bar graphs display improvement charts and projected scores. A "random start" feature allows the second-time test taker to skip over the basics and brush up on more difficult areas of study (trigonometry, reading comprehension, etc.). A review of high school grammar is included for the Test of Standard Written English.

Simon & Schuster Software, 212-373-8882 (see address list, page 14).
Circle #201 on Reader Service Card

GRATIS GRAPHICS

While supplies last, Broderbund is including a *Special Edition Graphics Library* disk with specially marked packages of *The Print Shop.* The disk, not available as a stand-alone product, includes over 100 graphics, borders, and full panel designs that can be used to supplement those included in the main program.

Broderbund Software, 415-492-3200 (see address list, page 14).
Circle #205 on Reader Service Card

TRADE-IN EXTENSION

Commodore has extended until December 31 the trade-in program that allows owners of any Commodore computer to receive a $100 credit toward the purchase of an Amiga 500 or 2000. Further information can be obtained at any Commodore dealer, or direct from Commodore.

Commodore Business Machines, 800-343-3000 or 215-431-9100 (see address list, page 14).
Circle #206 on Reader Service Card

MUSIC WRITER

The MAESTRO!, a menu-driven composition program, lets users select notes by placing the cursor at the proper position on the musical staff, and duration by moving the cursor up and down a column offering durations from 32nd notes upward, including triplets, dotted notes, double dotted notes, grace notes, tied notes, and non-standard durations. The SID chip's entire eight octaves are supported, and up to 1023 notes are permitted for each of its voices. Other capabilities include changing the ASDR envelope, making keyboard and programmed changes in tempo and volume, silencing one or more voices so the user can learn an individual vocal part, transposing to other keys, and cut and paste. Due to memory restrictions, the program does not include fancy graphics, printout capability, or support for SID filters, resonance, and Ring Modulation. Price is $24.95 plus $3.00 shipping (CA residents add sales tax).

Zwetzig Associates, 415-339-9396 (see address list, page 14).
Circle #184 on Reader Service Card

REPLACEMENT CPU

The Turbo Master CPU Processor Accelerator, an onboard replacement microprocessor, plugs into the C-64's expansion port to provide the computer with four times faster processing speed. Also included are turbo disk routines in ROM for five times faster disk load and save, and a DOS wedge in ROM. Unlike other products which speed up only the disk drive, Turbo Master accelerates screen graphics, word processor functions (scroll, search and replace, insert), number crunching, and spreadsheet recalculation. The $179 price includes shipping to US addresses, and a 10-day money back guarantee.

Schnedler Systems, 704-274-4646 (see address list, page 14).
Circle #185 on Reader Service Card

VIRUS RX

Computer Viruses—A High-Tech Disease explains viruses (to which autobooting computers like the C-128 are particularly susceptible), their history, how they work, and what can be done to protect against them. Several rudimentary programs demonstrate some of the ways viruses can infect your computer. 288 pages; $18.95.

Abacus, 616-698-0330 (see address list, page 14).
Circle #189 on Reader Service Card

GRAPHICS SHOW

The 5th Annual Computer Graphics New York Show, to be held January 17-19 in the Jacob K. Javits Convention Center, will showcase graphics hardware, software, and services. Sessions will address desktop publishing, corporate video/animation, business and corporate graphics, and CAD. Admission is free to those who preregister.

Exhibition Marketing & Management Co. Inc., 703-893-4545 (see address list, page 14).
Circle #190 on Reader Service Card

25¢ SAVED

Commodore has saved 25¢ by neglecting to inform us at *Ahoy!* that production of the original Commodore 128 model has ceased. It was dropped in favor of the 128D (with detachable keyboard and built-in disk drive). We had to learn of the change from the September issue of Commodore's own magazine, just as some of you may have. We mention it here primarily so that you'll know why we didn't tell you sooner.

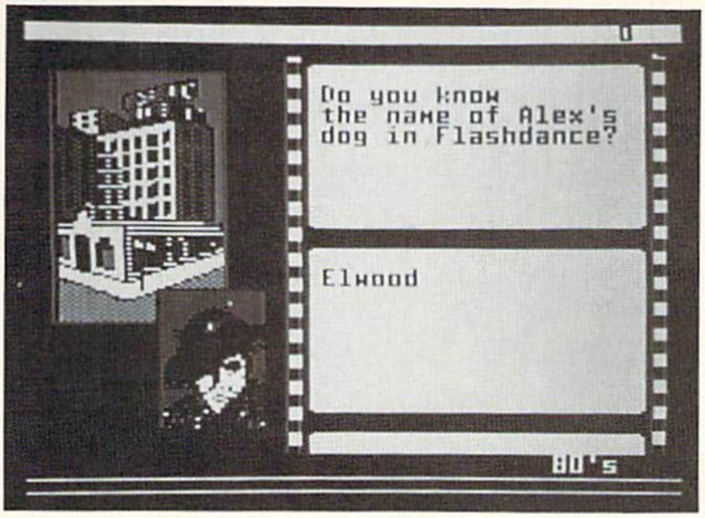
We'd be interested in knowing what Commodore will do with the 25¢ they saved. What did they determine to be a better value for their money than the good media relations a timely press release could have fostered? We don't know of any use they could find for 25¢ that would be worth nearly as much as that. About the only thing we could think of that even comes close would

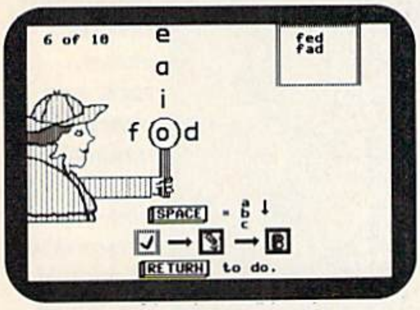
be a letter to our readers, apologizing for their negligence. But it's unlikely that the money will be invested that way, since we've received no such letter on the many occasions in the past when the same sort of thing happened.

Perhaps Commodore is going to hold on to the 25¢, just in case their fourth quarter turns out to be less profitable than expected. That way, if dividends are disappointing, they can divide the 25¢ among their stockholders. If you're in that category, check your year-end statement for your share of those two bits.

Commodore International, 215-431-9100 (see address list, page 14).
Circle #188 on Reader Service Card

Why waste money on acting lessons when your Ticket to Hollywood *is waiting? Eight decades of movie history and thousands of facts are covered.*





Basic phonics skills for youngsters.

PHONICS TUTOR

Clue In on Phonics uses a Sherlock Holmes theme to reinforce basic phonics skills, including identifying single consonant sounds and short vowel sounds and making word families. Kindergarteners to fourth graders use a magnifying glass to identify blends and digraphs in words, or add blends and digraphs to various letter patterns to make words. In the lesson on vowels, students compare and match the sounds of vowel digraphs and diphthongs. They also identify words which become new words when the silent E is added.

Teachers can set the number of questions in a lesson, turn the sound on or off, decide what percent must be scored to play the reward game, and turn the reward on or off. Names and scores for up to 200 students can be stored alphabetically on disk. Available on the C-64 on either 5¼" or 3½" disk —$44.95 for one disk, $54.95 with backup, and $164.95 for class pack.

Gamco Industries, 800-351-1404 or 915-267-6327 (see address list, page 14).
Circle #183 on Reader Service Card

STAR 64

Who was born Maurice Micklewhite? What superstar made her escort follow two paces behind her? How many movies did Tracy and Hepburn make? You'll try to solve one of 25 mysteries by answering these and other questions in *Ticket to Hollywood* ($29.95), Blue Lion's latest C-64 travelogue. You'll cover eight decades of movie history and thousands of facts, from the silent screen to the present, as you explore landmarks and follow the footsteps of the stars with the aid of six 3-D maps.

Blue Lion Software, 617-876-2500 (see address list, page 14).
Circle #186 on Reader Service Card

SWEEPSTAKES

Epyx is promoting their products with three simultaneous contests:

The Print Magic Sweepstakes offers more than 100 prizes, with a grand prize of two three-night stays at the Hyatt Grand Champions Resort near Palm Springs, CA, plus airfare. Other prizes include CD players, road bikes, sampling keyboards, and memory telephones. You can enter by filling out an entry blank found at any Babbages, Egghead Discount Software, Electronic Boutique, Software Etc., or Warehouse store. Entries must be returned by January 31, 1989.

The Gold Rush Sweepstakes offers a chance at a grand prize of a vacation for four to Los Angeles plus $1300 for hotel and expenses, a first prize of round-trip tickets for two to LA, and 500 second prizes of U.S. Gold game posters. To enter, fill out the form inside packages of *Tower Toppler* and *Technocop* and return it by May 31, 1989.

In the Dive Bomber Sweepstakes, you can win one of 15 Avirex leather WWII type G-1 Navy flight jackets, or one of 80 Avirex silk classic aviator scarves. Fill out and return the card inside specially marked *Dive Bomber* boxes by May 31, 1989.

Epyx, Inc., 415-368-3200 (see address list, page 14).
Circle #187 on Reader Service Card

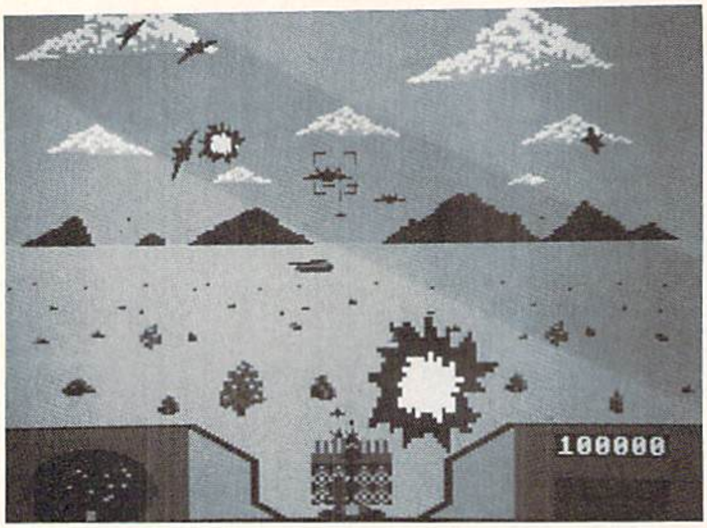
3-D GLASSES

Shades of Elvis, poodle skirts, and Joe McCarthy—when used with specially designed software, Haitex's X-Specs 3D (sic) glasses create the illusion of a 3-D image. The glasses, scheduled for release in a C-64 compatible version at some unspecified point in the future (they've just been released for the Amiga), control what each eye sees independently by closing and opening an optical shutter at 60 frames per second. Price will probably be in the $99.00 range.

Haitex Resources, 214-241-8030 (see address list, page 14.)
Circle #194 on Reader Service Card

SUPERBASE SHIFT

Precision Software of London, England has taken over the North American distribution of *Superbase Personal* and *Superbase Professional* from Progressive Peripherals & Software, establishing a US office in Denver to do so. Precision will also take over the servicing and technical support of the products.



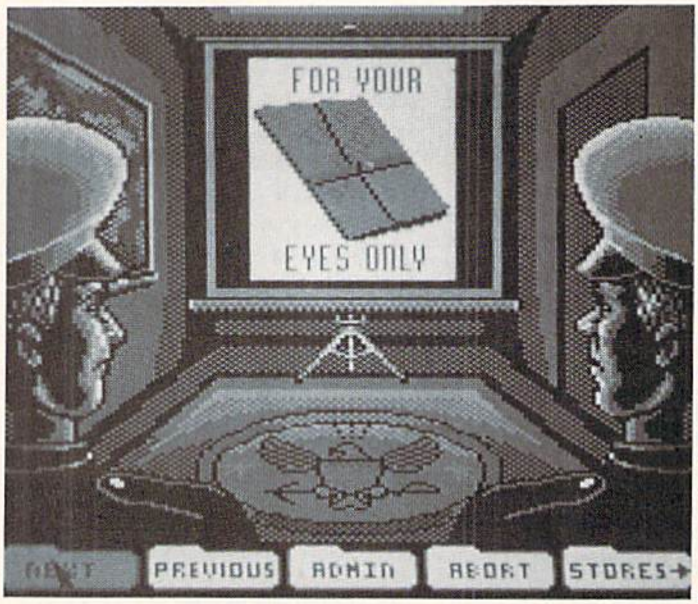
Heavy Metal—*Modern Land Combat Volume I lets you command modern weapons systems—a battle tank, an anti tank system, or a fast attack vehicle.*

Precision Incorporated, 214-929-4888 (see address list, page 14).
Circle #195 on Reader Service Card

GAMES

Heavy Metal—Modern Land Combat Volume I ($39.95) combines elements of simulation, arcade action, and strategy as you advance through the ranks of today's army. You start in the war as a Second Lieutenant, devising strategies to overrun enemy positions. Once the strategy is set you move to the front line, commanding one of three modern weapons systems: the M1A1 Abrams (the US Army's newest, most sophisticated battle tank), the Martin Marietta Air Defense Anti Tank System, aka ADATS (located at your forward supply stations to defend against air and ground attack), and the XR311 Fast Attack Vehicle, or FAV (based on the actual US Army vehicle used to attack outlying enemy stations).

Access Software, 801-298-9077 (see address list, page 14).
Circle #191 on Reader Service Card



Battling destroyers, planes, subs, and mines while navigating through a non-stop firestorm is all part of the fun of **Ocean Ranger.** *The action takes place in four of the world's top military hotspots.*



Ocean Ranger ($34.95) simulates the operation of a next-generation missile ship. Battling in four of the world's military hot spots (the Bering Sea, Southeast Asia, Central America, and the Persian Gulf), you pilot your craft through a non-stop firestorm while destroying primary and secondary targets. Missions entail battling destroyers, planes, submarines, and mines, aboard a missile ship armed with 75mm cannons, Sea Sparrow and Harpoon missiles, depth charges, chaff, and an ECM radar jammer. Players get a 360 degree view around the ship through bow, port, starboard, and stern. Map, damage, briefing, and stores screens can be accessed.

Activision Entertainment, c/o Mediagenic, 415-329-0800 (see address list, page 14).
Circle #203 on Reader Service Card

Previously released for the Amiga, the C-64 conversion of *ZOOM!* ($29.95) lets one or two players guide a character named Zoomer through 50 levels of an outer space Zoomland. Though he's being chased by a gang of enemies, the game's action is strictly non-violent. A 30 day unconditional money back guarantee is offered.

Discovery Software, 301-268-9877 (see address list, page 14).
Circle #193 on Reader Service Card

From MicroIllusions:

Faery Tale Adventure follows Philip, Julian, and Kevin through the wilderness, as they venture into caves, castles, and even the astral plane in search of the Dream Knight and the stolen Talisman.

The first in the One to One series of arcade games featuring one to one playability with the computer or another human, over a modem or in person, *Firepower* is a continuous action tank battle.

MicroIllusions, 800-522-2041 or 818-360-3715 (see address list, page 14).
Circle #204 on Reader Service Card

Accolade and Jack Nicklaus have signed a three year contract to produce home computer golf simulations. The first, *Jack Nicklaus' Greatest 18 Holes of Major Championship Golf,* is based on the recently released tape from the ABC Sports Video Library. C-64 gamers can play on 18 of Jack's favorite holes, as well as two of his invention.

GET ACCESS TO REAL BUYING POWER... WITH THE Ahoy! ACCESS CLUB!

Subscribing to *Ahoy!* and/or *Ahoy!'s AmigaUser* has always made sense—for you and for us. We get to keep more of your money when we cut out the middlemen (our distributor and your newsdealer), and we kick some of the savings back to you with a discount rate.

And now you can save even more—in fact, you can save the cost of your subscription many times over!

The *Ahoy!* Access Club, launched in January 1986, has been expanded to offer its members even more clout in the Commodore marketplace. And for a limited time, membership will be awarded free to subscribers!

Here are some of the ways the *Ahoy!* Access Club can boost your buying power:

• The *Ahoy!* Access Club *Clipper,* published 12 times a year, contains exclusive discount offers on products advertised in *Ahoy!* and *Ahoy!'s AmigaUser.* Participating vendors offer reductions of 10%, 20%, 30%, or more on selected items, free bonus merchandise, and special closeout and combo offers not advertised elsewhere—all for Club members only!

• The *Ahoy!* Access Club Card is your ticket to discounts at participating computer software, hardware, and book dealers, and reduced admission at Commodore and Amiga conventions and swap meets across North America. (Details are found in each issue of the *Clipper.)*

• The *Ahoy!* Access Club BBS (modem required) offers continuously updated information on new offers available through the Club, as well as late-breaking industry news, corrections and updates to articles in *Ahoy!* and *Ahoy!'s AmigaUser*, and free electronic mail facilities. Operation is 24 hours a day, 7 days a week—for Club members only!

If you are presently a subscriber to *Ahoy!* or *Ahoy!'s AmigaUser*, your membership has already been activated. You'll receive the *Ahoy!* Access Club *Clipper* bound into each issue.

If you're not a subscriber, fill out and return the postpaid card bound between pages 50 and 51 today!

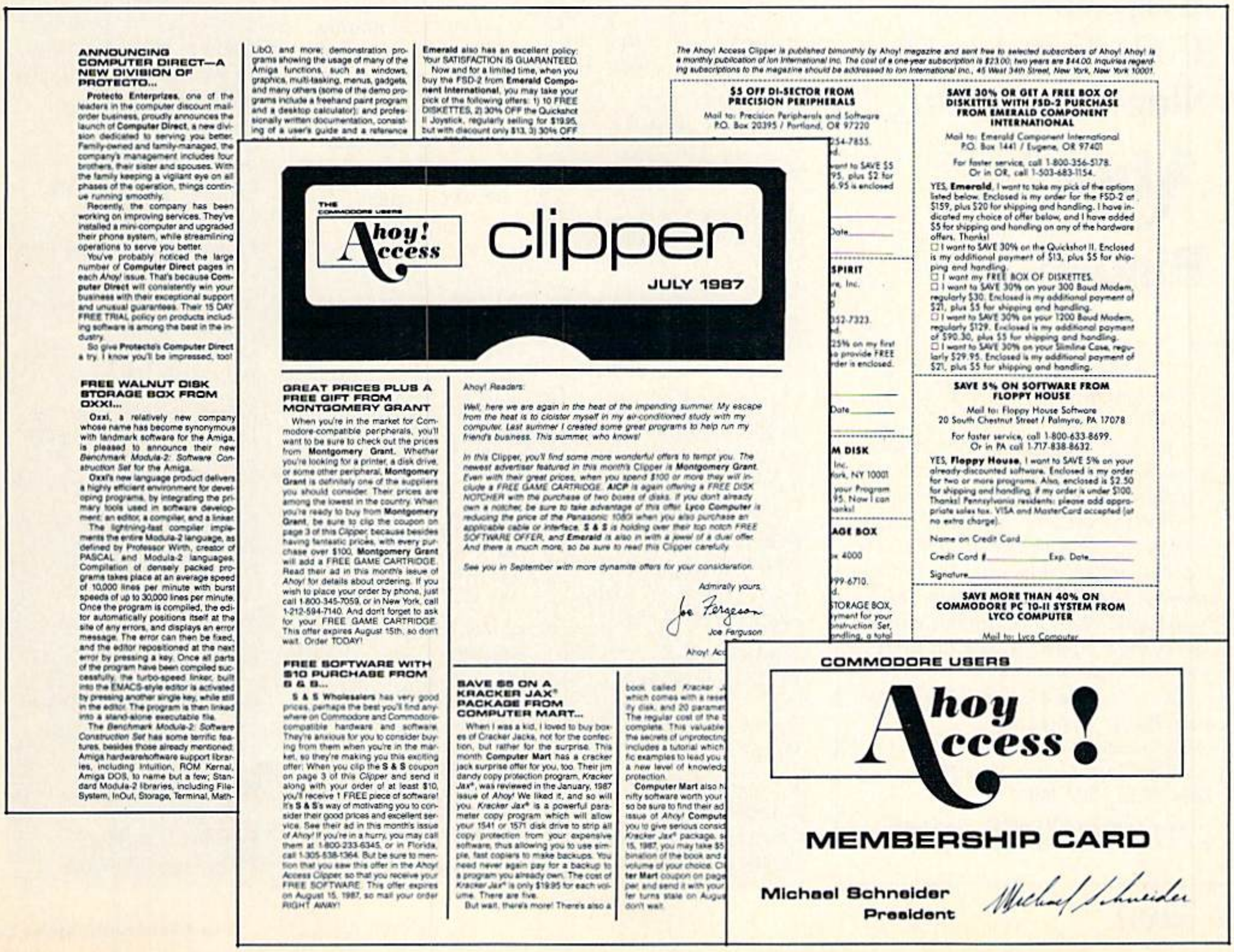
Let everyone else pay list price. You don't have to...when you have Access!

LOCK IN YOUR FREE MEMBERSHIP NOW!

Ahoy! Access Club membership will be included free with your paid subscription for a limited time only.

You are guaranteed free membership for the duration of any subscription paid for prior to December 31, 1988. After that date, a small additional charge may be levied.

So why not lock in free membership for as many years as you wish by extending your subscription now?





Jack Nicklaus' Greatest 18 Holes ***is based on the ABC video release.***

You can compete against Nicklaus, against three human opponents, or against a variety of computer-controlled men and women. Features include skins scoring or stroke play, pro, men's, or ladies' tees, wind intensity and direction, and uphill or downhill lies. The game will be available by Christmas shopping season.

Accolade, 408-985-1700 (see address list, page 14).
Circle #192 on Reader Service Card

As the *Global Commander* ($29.95) of the United Nuclear Nation in the year 2032, you are responsible for the welfare of the 16 aggressive, untrustworthy member nations. This involves managing the earth's economies, detente, resources, food supply, communications—and nuclear missiles. To head off the threat of world destruction you must fulfill all needs, cool hot tempers, mend stressed relations, and maintain military security. Your executive privileges include eavesdropping on radio transmissions, spying on illicit activities via satellite, and intercepting missiles with SDI systems.

Datasoft, c/o Electronic Arts, 415-571-7171 (see address list below).
Circle #224 on Reader Service Card

Mindscape has adapted three Sega coin-op titles to the 64:

Out Run ($34.95) lets you race a high performance auto through European cities, woods, beaches, and the Swiss Alps at speeds of up to 200 mph.

Space Harrier ($29.95) charges you, an astral exterminator, with the task of ridding the polluted galaxy of some of the most ghastly creatures imaginable.

In *Alien Syndrome* ($29.95) you must rescue people trapped inside an alien-infested genetic laboratory before the lab's self-destructing mechanism makes the job unnecessary.

Mindscape, 312-480-7667 (see address list below).
Circle #225 on Reader Service Card

Companies Mentioned in *Scuttlebutt*

Contact companies directly for more information; or save time and money by using the Reader Service Card bound between pages 50 and 51.

Abacus
5370 52nd Street SE
Grand Rapids, MI 49508
Phone: 616-698-0330

Access
545 W. 550 South, Ste. 130
Bountiful, UT 80410
Phone: 801-298-9077

Accolade
550 S. Winchester Blvd.
San Jose, CA 95128
Phone: 408-985-1700

Activision
3885 Bohannon Drive
Menlo Park, CA 94025
Phone: 415-329-0800

Blue Lion Software
90 Sherman Street
Cambridge, MA 02140
Phone: 617-876-2500

Broderbund Software
17 Paul Drive
San Rafael, CA 94903-2101
Phone: 415-492-3200

Commodore
1200 Wilson Drive
West Chester, PA 19380
Phone: 215-431-9100

Datasoft
c/o **Electronic Arts**
1820 Gateway Drive
San Mateo, CA 94404
Phone: 415-571-7171

Digiscape Software
P.O. Box 113058
Carrollton, TX 75011-3058
Phone: 214-241-9891

Discovery Software
163 Conduit Street
Annapolis, MD 21401
Phone: 301-268-9877

Epyx
600 Galveston Drive
P.O. Box 8020
Redwood, CA 94063
Phone: 415-368-3200

Exhibition Marketing
8300 Greensboro Drive
McLean, VA 22102
Phone: 703-893-4545

Gamco Industries, Inc.
Box 1911
Big Spring, TX 79721
Phone: 800-351-1404; in TX 915-267-6327

Haitex Resources
208 Carrollton Park, Suite 1207
Carrollton, TX 75006
Phone: 214-241-8030

LLM Press
150 Broadway
New York, NY 10038
Phone: 212-766-3785

MicroIllusions
17408 Chatsworth Street
Granada Hills, CA 91344
Phone: 800-522-2041; in CA 818-360-3715

Mindscape Inc.
3444 Dundee Road
Northbrook, IL 60062
Phone: 312-480-7667

Online Information Network
5707 South 86th Circle
P.O. Box 27347
Omaha, NE 68127
Phone: 402-593-4593

Precision Incorporated
8404 Sterling St., Suite A
Irving, TX 75063
Phone: 214-929-4888

Schnedler Systems
25 Eastwood Road
P.O. Box 5964
Asheville, NC 28813
Phone: 704-274-4646

Simon & Schuster Software
One Gulf+Western Plaza
New York, NY 10023
Phone: 212-373-8882

Zwetzig Associates
5932 Bruns Court
Oakland, CA 94611
Phone: 415-339-9396

Circle #214 on Reader Service Card →


IT'S A JUNGLE OUT THERE AND DATA EAST PUTS YOU IN IT.
VICTORY ROAD
GUERRILLA WAR
It happens so fast. You're kicking back, you and your best friend, just checking out two of the latest arcade action games from Data East and, zap, you're fighting with full fire power and up to your neck in heart-stopping, eye-popping jungle.
Victory Road pits the heroes of the #1 smash hit, *Ikari Warriors,* against a hideous horde that has heroes for lunch—Stonehead and his wrecking crew of bizarre and brutal beasts.
Guerrilla War takes you behind the headlines to the battlelines. It's you versus them—and let us guarantee you that "them" is an army of evil that will keep your trigger finger active for hours.
Victory Road for the IBM, Commodore and Apple II computers. And *Guerrilla War,* for the IBM and Commodore computers. Addictive action with great graphics. Hey, it's a jungle out there. And now we've brought it home.
DATA EAST
DATA EAST USA, INC. 470 Needles Drive, San Jose, CA 95112 (408) 286-7074
IBM SCREENS SHOWN. OTHER COMPUTER VERSIONS MAY VARY.
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- Commodore 64c Computer
- 1541 II Disk Drive
- 12" Monochrome Monitor
- Genuine IBM® Printer With Interface And One Roll Of Paper
- GEOS Program For Word Processing & Drawing

Our Low Sale Price

$395⁹⁵

List $825

C128D Computer



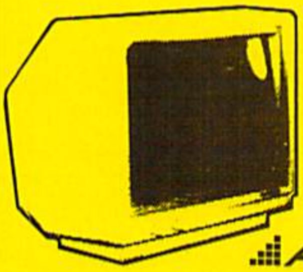
- Full 128 Detached Keyboard
- 1571 Drive With 128K Of User Memory Expandable To 640K
- 3 Operation Modes (C64, C128, & CP/M, Ver. 3.0)
- 40/80 Column Output, 16 colors
- **Free Programmer's Reference Guide**

Our Low Sale Price

$419.95

List $549

12" Amber Monitor



2 Year Limited Manufacturer's Warranty

AMDEK

- High Resolution
- 80 Column
- 1000 Lines At Center
- Great For Business
- Fantastic Value

Our Low Sale Price

$79.95

List $329

5¼" Floppy Disks

Double Sided
Double Density
Minimum Quantity 50
Maximum Quantity 250

19¢ each

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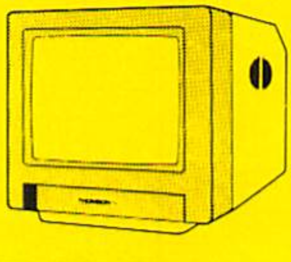
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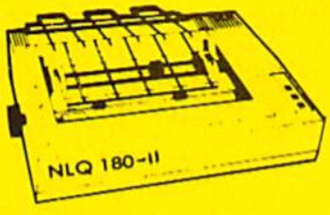
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TUBULAR!

For the C-64

By Bob Blackmer

Tubular! is an addictive multilevel arcade game for the C-64. The object is simple: collect the 14 bells and make it to the top of a huge pyramid. I've designed 16 different and challenging levels for your enjoyment.

The only way you get from floor to floor is through the high pressure tubes that turn the pyramid into a giant maze. The up and down tubes are clearly marked and of different colors. Step over a down tube and it activates, rushing you downward. Sometimes the tubes will be stacked, and if you do nothing you will continue through the next tube. Pushing on the joystick left or right when you reach a floor will allow you access to that floor. There will be times when you go up and there is no way down again, which is disastrous if you miss any bells.

The only access to the top floor is an up tube which appears when you have gathered all the bells. Some levels you will find easy to solve, others will give you a hard time. Consider yourself a true puzzle solver if you can master all 16 levels.

You start out in the bottom right hand corner of the pyramid, and have 90 seconds in which to complete a level. To help you out, you get an extra life with each level completed, up to a maximum of nine. I've also included a kill key which is activated by pressing the RUN STOP key; you'll know when to use it.

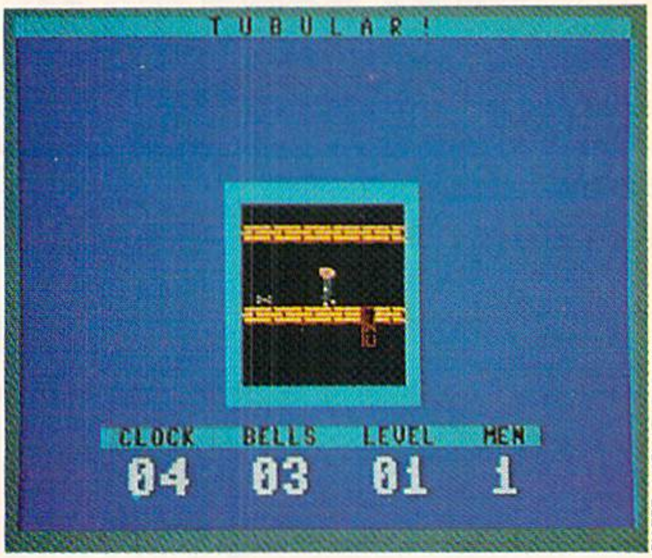


PHOTO: MICHAEL R. DAVILA

I'm sure you will find this program addictive and challenging, which, judging by your letters, is what you want.

Tubular! is written entirely in machine language for speed and playability, and must be entered using *Flankspeed* (see page 63). After typing in and saving a copy, reset the machine and LOAD "TUBULAR!",8,1. Then SYS 49152 to start. ☐ *SEE PROGRAM LISTING ON PAGE 64*

TRI WORDS

For the C-128

By Bob Blackmer

Tri Words is an entertaining word game for the C-128 that is also useful as an educational tool. You play against the computer, forming three-letter words from a grid of 16 jumbo sized letters which are chosen randomly for each game. The program utilizes its own built-in database to select words and to check your word for validity.

You can set the intelligence level of the computer. The computer will select words according to their usage and familiarity. Simple words like CAT will appear early in the game, while vague words such as OHM will only show up late in the game. I advise linguists who seek a challenge to select the super brain.

Type in the second program, TRI.DATA (page 71), first. When this program is run it will check the data for any typing errors. If your typing is correct, the program prompts you to press a key to write the binary database WORDFILE to disk. The main program will load this file at the start of each session, so save it on the same disk as the main program.



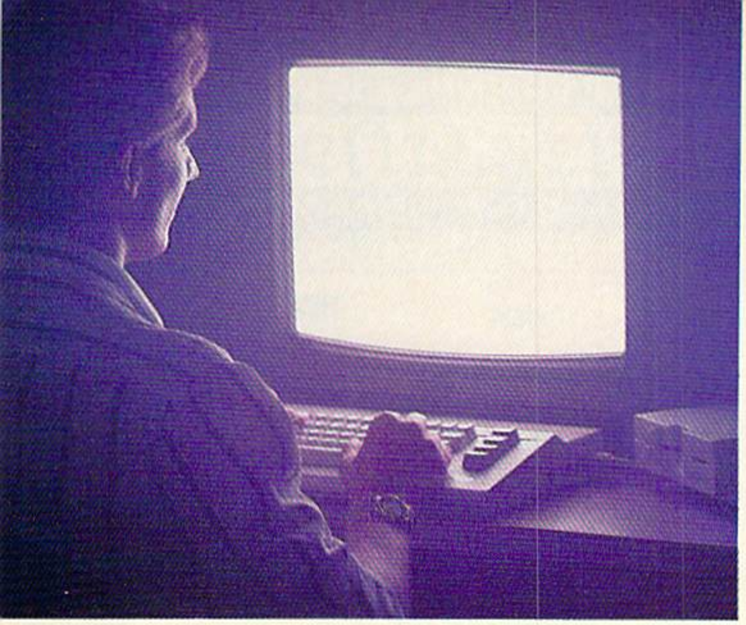
PHOTO: MICHAEL R. DAVILA

Using a standard dictionary to establish the word list, I have omitted all slang words and abbreviations. Only legal words are contained in the final list of 489, which will provide a formidable challenge.

The game is designed as you against the computer, but is great played in groups. Everyone can help form words while one person handles the input.

You will be prompted to enter your word. Type in any three letter word and press RETURN. The program will inform you if your word contains double letters (each word must use three different letters—double letter words like

Continued on page 74



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Here's what some of those people have to say about Renegade:

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Note that the *Art Gallery* is not a contest. Published pictures are selected in an arbitrary and capricious fashion by the Art Director, based solely on their artistic merit.







For the average person, Christmas or Chanukah means just the usual round of presents, celebrations, and time off from work or school. But *Ahoy!* readers have something really special to look forward to: the annual holiday edition of the *Art Gallery*. Above is *Reindeer* by Jason Anderson (Independence, MO), created on *Supersketch.* Top right: *Winter Sunset* by John A. Skilba (Lemont, IL), drawn on *The Artist*. Middle right: *Santa's Sack,* also by Jason Anderson. Bottom right: *Winter Hills* by Peter Leontescu (Bronx, NY), on *Koala.* Better start cleaning that chimney!

FLOTSAM

Send your comments on any aspect of Commodore computing to *Flotsam, c/o Ahoy!*, 45 West 34th Street —Suite 500, New York, NY 10001. We can print only a few letters, but we individually answer as many as we can—and we read every one.

I have a very strong feeling that I've purchased your magazine for the last time with the July 1988 issue. I've been buying your magazine each month since January 1986, but the issue I refer to left me with a sour taste in my mouth.

In your *Art Gallery* section for that issue, devoted to images related to American Independence Day, you show an illustration of a Canadian post office. You observe: "True, it's a Canadian post office. But where would our neighbors north of the border be without the American Revolution? Still trapping furs, no doubt, and trading them to us for three-cornered hats and powdered wigs."

Perhaps the author meant to be humorous. Well, I see nothing funny in his comments. I am a Canadian, and proud of it, just like the author is an American and proud of it. The author insinuated that we north of the border are living in the past. May I remind you that Commodore started in Toronto, Ontario; *Transactor*, a recognized Commodore publication, is based here; and important industry figures like Steve Punter (developer of the telecommunications protocol that bears his name) and Steven Douglas (author of *PaperClip)* are also Canadian-born.

We, your Canadian neighbors, are not the poor country bumpkins that your author would have your US readers believe. —Wayne D. Anderson
Greenwood, Nova Scotia, Canada

We're sorry you were offended by our remark. We certainly didn't mean to imply that Canadians were living in the eighteenth century, and we're at a loss to understand how you managed to make that inference from the passage quoted. Rest assured that we've always thought of our primary audience as North America—never as the United States alone.

Continued on page 31

TIPS AHOY!

Compiled by Michael R. Davila

Send your best programming and hardware hints to *Tips Ahoy!*, c/o Ion International, 45 W. 34th St.–Suite 500, NY, NY 10001. Include a stamped and self-addressed envelope.

RASTER LINE

This program creates a reverse white line at the top of the screen like the one of many word processors.

If the user doesn't want to scroll the characters in this line, he can change with zero the byte at location $D011; in this way the line will be clean.

Now to write something in this line the user must POKE the first 40 bytes of the screen memory ($0400).

–Genco Ludovico
Mola di Bari, Italy

```
•140 FORJ=828TO903:READX:POKEJ,X
•150 CS=CS+X:NEXT
•160 IFCS<>8431THENPRINT"ERROR!":END
•170 PRINT"S":SYS828
•200 DATA120,169,91,141,20,3,169,3
•210 DATA141,21,3,169,50,141,18,208
•220 DATA173,17,208,41,127,141,17,208
•230 DATA169,129,141,26,208,88,96,173
•240 DATA25,208,141,25,208,48,7,173
•250 DATA13,220,88,76,49,234,173,18
•260 DATA208,201,58,176,10,169,1,141
•270 DATA33,208,169,58,76,130,3,169
•280 DATA0,141,33,208,169,50,141,18
•290 DATA208,76,188,254
```

CUP OF BOOLEAN

A Boolean expression, named for the logician George Boole, is often called a logical expression. These expressions only have a value of TRUE or FALSE.

Whether you know it or not, the Commodore computer has a built-in type of Boolean expression. Instead of values TRUE and FALSE, we use a one to represent TRUE and a zero to represent FALSE.

Type in and run the program below. The prompts are self-explanatory. After all questions have been answered, you will be shown whether two variables contain the same thing or not. This is acknowledged by a printed TRUE or FALSE.

Another way to view this program, would be to add the following lines:

```
IF NAMEBOOLEAN THEN PRINT"TRUE":GOTO 19
18 PRINT"FALSE"
20 IF AGEBOOLEAN THEN PRINT"TRUE":END
21 PRINT"FALSE"
```

where NAMEBOOLEAN and AGEBOOLEAN are TRUE only if they contain the value of one. –Michael Jaecks
Alamogordo, NM

```
•0 DIM BOOLEAN$(1):BOOLEAN$(0)="FALSE":BO
OLEAN$(1)="TRUE"
•1 RV$=CHR$(18):RO$=CHR$(146)
•2 PRINTCHR$(147);:INPUT"ENTER YOUR NAME"
;N$:INPUT"ENTER YOUR AGE";A
•3 PRINT:INPUT"ENTER ANOTHER NAME";N1$:IN
PUT"ENTER ANOTHER AGE";A1
•4 REM
•5 REM LINE 9 ASSIGNS A BOOLEAN VALUE
•6 REM OF ZERO FOR FALSE OR ONE FOR
•7 REM TRUE TO THE VARIABLE NAMEBOOLEAN
•8 REM
•9 NAMEBOOLEAN=ABS(N$=N1$)
•10 REM
•11 REM LINE 15 ASIGNS A BOOLEAN VALUE
•12 REM OF ZERO FOR FALSE OR ONE FOR
•13 REM TRUE TO THE VARIABLE AGEBOOLEAN
•14 REM
•15 AGEBOOLEAN=ABS(A=A1)
•16 PRINT:PRINT"TRUE OR FALSE?":PRINTRV$;
N$;RO$;" IS THE SAME AS ";RV$;N1$
•17 PRINT BOOLEAN$(NAMEBOOLEAN)
•18 PRINT:PRINT"TRUE OR FALSE?":PRINTRV$;
A;RO$;" IS THE SAME AS ";RV$;A1
•19 PRINT BOOLEAN$(AGEBOOLEAN)
```

DMA REMEDIES

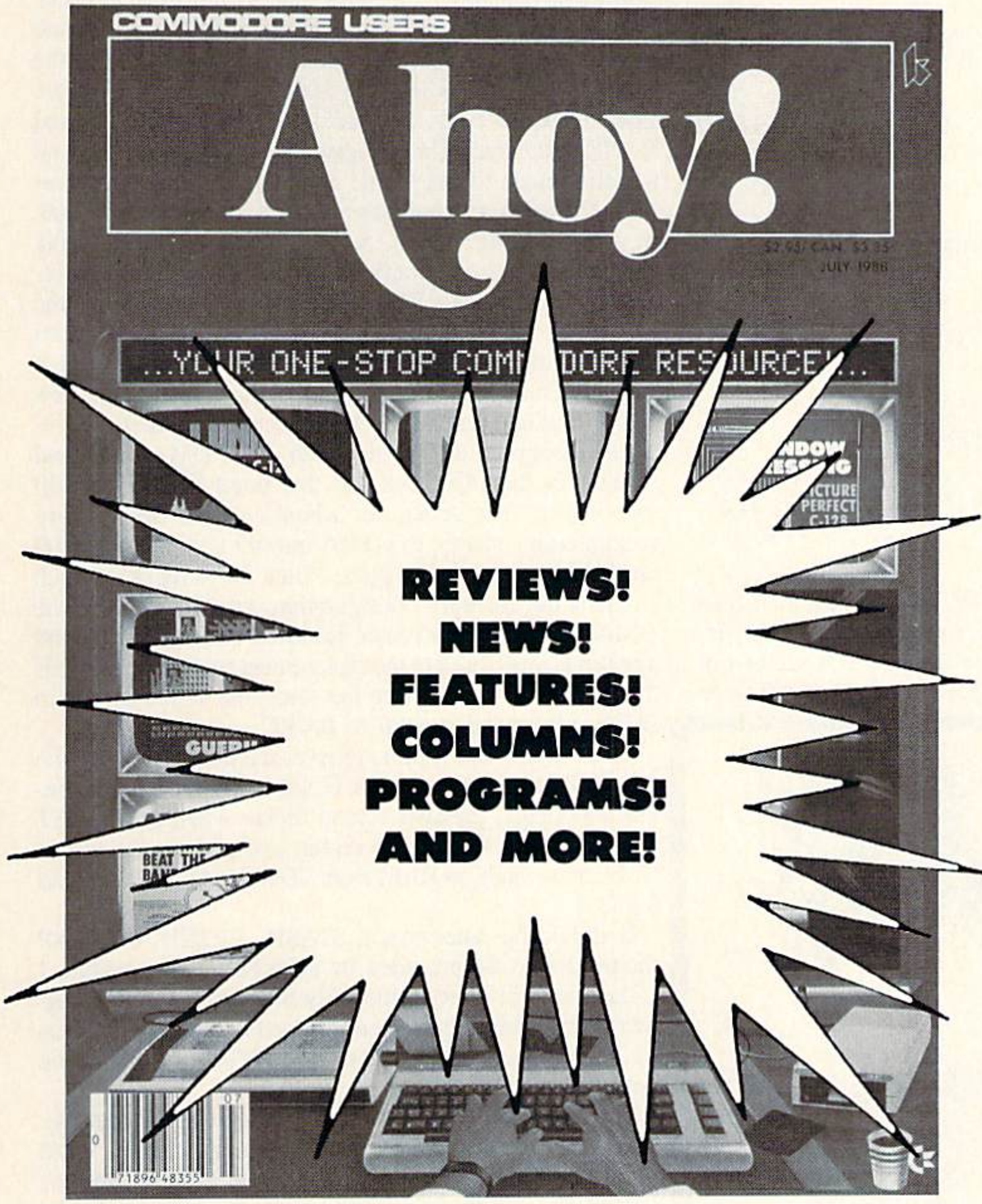
Available for the C-128 are the 1700 128K and 1750 512K RAM Expansion Units (REU). The C-128 comes equipped with the three easy to use statements, STASH, FETCH, and SWAP which operate on the REU. But there are some problems with these commands.

Problem one is that the C-128's 8502 microprocessor must be in SLOW (1 mhz) mode before the DMA command is issued. If the C-128 is in FAST (2 mhz) mode when the DMA command is issued, the system will lock up. This problem can be avoided by using a SLOW command immediately before the DMA command and a FAST command immediately after. However, this is the responsibility of the programmer.

Problem two is that if the 40 column display and FAST mode are being used, then the solution to problem one will cause the 40 column screen to flicker while the DMA takes place.

Problem three is that the next to the last routine involved with these DMA commands, located in ROM, contains a bug. It first gets the memory configuration data for the last used BANK command. If no BANK command has been used, then the bank used is bank 15. This memory configuration data which is correct up to this point is ANDed with $FE (254) which forces the 4K I/O block to be switched in between $D000 and $DFFF (53248 to 57343)

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in all cases. While this is necessary on the C-64 it is *not* necessary on the C-128. Forcing the I/O block in makes it impossible to use a DMA command on this area of RAM in banks 0 and 1. If you wish to move this area of memory to the REU, TOUGH LUCK!

The following machine language routine loaded by a BASIC loader routine solves all of these problems.

```
·1000 DMA=1008: JMP=76: ADR=2816: HI=INT(
 ADR/256):LO=ADR-(HI*256)
·1010 POKE DMA,JMP: POKE DMA+1,LO: POKE D
 MA+2,HI
·1020 BYTES=26: REM NUMBER OF BYTES IN DM
 A REPLACEMENT ROUTINE
·1030 FOR LD=0 TO BYTES-1
·1040 :  READ ML: POKE ADR+LD,ML
·1050 NEXT LD
·1060 NEW: REM ERASE LOADER ROUTINE
·1070 REM DATA REPLACEMENT DATA
·1080 DATA 173,48,208,72,169,0,141,48,208
·1090 DATA 174,213,3,32,107,255,174,0,255
·1100 DATA 32,243,3,104,141,48,208,96
```

The starting location of the DMA issuer routine located is $3F0 (1008). The BASIC loader routine replaces the first instruction LDX $FF00 of the original DMA issuer routine with JMP $0B00. The replacement routine will be located in the cassette buffer. The JMP instruction redirects *any* call to this routine to the replacement routine.

In the replacement routine the A register is loaded from $D030 (53296) which determines the speed of the 8502. If this byte contains a 1 then the 8502 will operate in FAST mode. If this byte contains a 0 then the 8502 will operate in SLOW mode. The speed of the 8502 is pushed onto the stack, then a 0 byte is stored to $D030, forcing SLOW mode. Location $3D5 holds the bank number from the last used BANK command. The X register is loaded from here and a call is made to the kernal routine at $FF6B which returns the memory configuration data for the chosen bank in the A register. The X register is loaded from $FF00, the current memory configuration data which will be restored later when the DMA transfer is complete. Then the old DMA routine is called at location $3F3, three bytes past the original starting location. The Y register which remains untouched throughout the execution of the new DMA routine contains the DMA command itself. The Y register is stored to $DF01 which is the DMA command register in the I/O block. At this point bank 15 is still switched in. The A register which contains the memory configuration data for the DMA transfer is stored to $FF00 and DMA transfer takes place. Then the X register which contains the memory configuration data from before the DMA command was issued is stored back to $FF00 and a return is made back to the replacement routine which pulls the processor's speed from the stack and stores it back to D030 and returns control to BASIC.

The replacement routine relieves the programmer of the responsibility of insuring the C-128 is in SLOW mode before the DMA, prevents screen flicker when using FAST mode with the 40 column screen and permits the use of DMA commands on RAM from $D000 to $DFFF in banks 0 and 1.

It should be noted that a STASH, FETCH, or SWAP should always be preceded by a BANK 0 or a BANK 1 command to prevent accidentally overwriting the I/O register if this area of memory is involved in the DMA. Otherwise the system will lock up on a FETCH or SWAP on the I/O registers.

The replacement DMA routine is completely relocatable. If you wish to relocate it, just change the value of ADR to the address in memory where you will be placing the routine. Before I forget, this replacement routine allows the assembly and machine language programmer to freely use the C-128's DMA CALL routine at $FF50 on the RAM beneath the I/O block with no problems at all.

—Eric Schneider
Florissant, MO

COMPUTED GOTO/GOSUB

For the C-128 owner, here's a short ML routine that provides computed GOTO/GOSUB capability. Rather than being limited to actual line numbers, such expressions as GOTO.N, GOTO.1000+A*X, GOSUB.L(J), and GOSUB.VAL(A$) are provided. The decimal point is required before the expression, otherwise a SYNTAX ERROR results. It will not be considered part of any math that follows.

Continued on page 57

COMMODARES

PROGRAMMING CHALLENGES

By Dale Rupert

Each month, we'll present several challenges designed to stimulate your synapses and toggle the bits in your cerebral random access memory. We invite you to send your solutions to:

Commodares, c/o *Ahoy!*
P.O. Box 723
Bethel, CT 06801

We will print and discuss the cleverest, simplest, shortest, most interesting and/or most unusual solutions. Be sure to identify the *name* and *number* of the problems you are solving. Put *your* name and address on the listings as well. Show sample runs if possible. Briefly describe your solutions and tell what makes them unique or interesting, if they are. You must enclose a stamped, self-addressed envelope if you want any of your materials returned. Solutions received by the middle of the month shown on the magazine cover are most likely to be discussed, but you may send solutions and comments any time. Your original programming problems, suggestions, and ideas are equally welcome. The best ones will become *Commodares!*

PROBLEM #60-1: EIGHT QUEENS

This classic problem was suggested by Robert Woods (Sherwood, OR). He says it is a tough one. Let your computer find all 92 arrangements of 8 queens on a chess board for which no queen can attack any other. The chess board is 8 by 8. A queen can attack any piece on her own row, column, or diagonal in any direction. Solution #1 is displayed like this:

```
COLUMN:  1 2 3 4 5 6 7 8
ROW:     1 5 8 6 3 7 2 4
```

Rob's solution takes 35 minutes with printouts. Can you do better?

PROBLEM #60-2: UNSTRING COMMAND

In contrast to the Instring (INSTR) function which locates the first occurrence of a given character within a string, this problem requires you to implement an UNSTRING routine identifies the first position within a string which does *not* contain the given target character.

For example, if the given string is "AAAABAA" and the target character is "A", the UNSTRING routine returns 5, since the 5th character is not an "A". If the target is any other character than "A" in this example, UNSTRING returns 1, indicating that the first character does not match the target. If the given string is "AAA" and the target character is "A", UNSTRING returns 0 since every character in the given string is the target character.

PROBLEM #60-3: $10,000 SERIES

The New York Times (8/30/88) described a numerical series for which the famous mathematician John Conway offered a $10,000 reward for anyone who could determine a particular property of the series. Two weeks after this offer was made, another well-respected mathematician, Colin Mallows, found the answer (with the help of a Cray supercomputer, his wife, and another colleague). Dr. Conway had intended to offer $1000, but his videotaped lecture revealed that he had in fact offered $10,000, so that is what he paid. Dr. Mallows agreed to the $1000 payment, although he kept the $10,000 check for framing.

Your task is to write a program to generate this otherwise obscure series. It starts out like this:

1, 1, 2, 2, 3, 4, 4, 4, 5, 6, ...

The rules for generating the next term in the series are:

1. Take the last term of the series (6 for the portion of the series shown above) and use it as a counter value CV. Count that many numbers back to the left (counting the last term as #1). That brings us to the 3.

2. Start at the beginning of the series and count forward CV terms (6 terms in our example). That brings us to the first 4.

3. Add the results of steps 1 and 2 and write the sum as the next number in the series. Here 3 plus 4 is 7 which is the next term in the series.

PROBLEM #60-4: ROMAN-ARABIC II

Richard van Frank (Montclair, NJ) suggested this *Commodare* which we have previously done. Newcomers will enjoy it, and old-timers may find a better way of solving it the second time around. The user enters a Roman numeral from I to MMMCMXCIX and the computer returns the corresponding Arabic value from 1 to 3999.

This month we will discuss the best solutions to *Commodares* from the July 1988 issue of *Ahoy! Problem #55-1: Sig Digs* was submitted by Jim Speers (Niles, MI). The overall challenge was to accept any integer from 0 to 65535 and determine the numbers of 1's, significant 0's, and SIGnificant DIGits altogether in the integer's binary representation.

Jim challenged the readers to perform this feat in a one-line program. This short program from Robert Clark (Ocean Springss, MS) *almost* does the job:

```
·1 REM ====================================
·2 REM     COMMODARES PROBLEM #55-1 :
·3 REM         SIG DIGS
·4 REM     SOLUTION BY
·5 REM         ROBERT CLARK
·6 REM ====================================
·7 INPUTN:FORE=15TO0STEP-1:V=2[UPARROW]E:
 F=V<=N:N=N+V*F:U=U-F:S=S+(S=0)*F*(E+1):N
 EXT:PRINTU,S-U,S
```

In fact many readers took a similar approach, although not as concise as Robert's program. This program works for most integers, but not all. The problem is with the value 2 raised to the 15th power. The number 55201 has the binary representation

1101 0111 1010 0001

for which the program should respond with 9 1's, 7 significant 0's, and 16 significant digits in all. Unfortunately most solutions submitted (including Robert's above) gave 8 1's and 8 significant 0's. Two raised to the 15th power is 32768.0001 in Commodore BASIC, and that extra ten-thousandth causes trouble.

This program from Jan Sorensen (Brockville, ONT) uses the INT function and gives the right answer for all integers:

```
·1 REM ====================================
·2 REM     COMMODARES PROBLEM #55-1 :
·3 REM         SIG DIGS
·4 REM     SOLUTION BY
·5 REM         JAN SORENSEN
·6 REM ======= C-128 ONLY ==============
·10 INPUT"INPUT INTEGER";N
·20 A=INT(N/2): IF A=N/2 THEN X=X+1: ELSE
 Y=Y+1
·30 N=A: IF N>0 THEN 20
·40 PRINT "1'S ="Y; "0'S ="X, "SIG DIGS =
 "X+Y
```

C-64 users may modify this solution to eliminate the ELSE statement. You may change line 20 to this:

```
20 A=INT(N/2): Y=Y+1: IF A=N/2 THEN X=X+
1: Y=Y-1
```

These statements assume that Y (the number of 1's) will be incremented. If X should have been incremented instead, then Y must also be decremented. Notice that Jan's solution does not use the exponentiation function. In general, avoid that function whenever possible. Exponentiation is slow and prone to round off errors that are sometimes significant. Be careful when you use it.

Thanks to Joshua Tempkin (Roanoke, VA) for his analysis of this problem. Joshua's solution below uses exponentiation, but the INT function takes care of its inaccuracy.

```
·1 REM ====================================
·2 REM     COMMODARES PROBLEM #55-1 :
·3 REM         SIG DIGS
·4 REM     SOLUTION BY
·5 REM         JOSHUA TEMPKIN
·6 REM ====================================
·10 INPUT"ENTER INTEGER FROM 0 - 53687091
 1";NM: IF NM<0 OR NM>53670911 THEN 10
·20 X=NM: S=0: N0=0: N1=0: I=29
·30 DO UNTIL I=0
·40 I=I-1: K=INT(2[UPARROW]I): IF X>=K TH
 EN N1=N1+1: S=1: X=X-K: ELSE N0=N0+1: IF
  S=0 THEN N0=N0-1
·50 LOOP
·60 NT=N0+N1: PRINT"NUMBER OF 1'S, SIG 0'
 S, SIG DIGS:": PRINT N1,N0,NT
```

Notice that Joshua's solution allow integers up to 536,870,911 (2 ↑29) since numbers that large are stored exactly in the computer.

You may modify this program to display the binary representation of the given number. In line 40 add PRINT "1";: before the ELSE statement and add PRINT "0";: before the second IF. Also add PRINT: at the start of line 60. C-64 users must rewrite the program to eliminate the DO UNTIL, LOOP, and ELSE statements.

Problem #55-2: Rapid Randomizer was submitted by Justin Smalley (Boulder, CO). The problem was to add line 30 to a program which rearranges a given 100-element ar-

ray in random order, as quickly as possible.

This solution from Jim Borden (Carlisle, PA) is almost the fastest.

```
•1 REM ===================================
•2 REM    COMMODARES PROBLEM #55-2 :
•3 REM       RAPID RANDOMIZER
•4 REM    SOLUTION BY
•5 REM       JIM BORDEN
•6 REM ===================================
•10 N=100: DIM X(N): FOR I=1 TO N: X(I)=I
 : NEXT
•20 T0=TI
•30 FORX=1TON:I=RND(1)*N+1:T=X(X):X(X)=X(
 I):X(I)=T:NEXT
•40 PRINT TI-T0"JIFFIES"
•50 FOR I=1 TO N:PRINT X(I);:NEXT
```

Jim's solution runs in 89 jiffies on my C-128 in FAST mode. Jim's program works by taking the elements of the array one at a time and swapping each one with a randomly selected element. After the 100th element has been swapped, the array should be in reasonably random order.

Looking at Jim's program, you might be hard pressed to make it any faster. In fact Doug Ropp (Phoenix, AZ) used an interesting twist to knock off a few more jiffies. His program listed here runs in 81 jiffies on my machine.

```
•1 REM ===================================
•2 REM    COMMODARES PROBLEM #55-2 :
•3 REM       RAPID RANDOMIZER
•4 REM    SOLUTION BY
•5 REM       DOUG ROPP
•6 REM ===================================
•10 N=100: DIM X(N): FOR I=1 TO N: X(I)=I
 : NEXT
•20 T0=TI
•30 X(0)=X(N):FORI=0TON-1:N=RND(N)*I:J=X(
 I):X(I)=X(N):X(N)=J:NEXT:N=I:X(N)=X(0)
•40 PRINT TI-T0"JIFFIES"
•50 FOR I=1 TO N:PRINT X(I);:NEXT
```

Doug (and many other readers) used periods instead of the 0's in line 30. I replaced them with 0's and found no speed difference in this application, so I left them. I really dislike seeing RND(.) instead of RND(0). Yes, I know that Commodore BASIC accepts it, and it does shave fractions of jiffies from certain applications. But in my opinion it is an obscure, non-standard, and just plain *cheap* programming practice.

So what did Doug do to gain the speed? He first moved X(100) to X(0). Now the range of random numbers needed is from 0 to 99 instead of 1 to 100. Consequently Doug's program does not need to add 1 to the calculated random number each time. Once the randomization is done, Doug's program restores N (in case this routine will be used again within another program), and it moves X(0) back up to X(100). Very clever indeed.

Now for *Problem #55-3: Unjumbled Words,* suggested by Eddie Byrd (Ste. Genevieve, MO). Eddie wanted to see every permutation of the letters of any given 5- or 6-letter word. I hinted that anyone with a good set of back issues of *Ahoy!* should be able to solve this one.

Wallace Leeker (Lemay, MO) dug through his collection and pulled out the April 1986 issue in which we discussed an algorithm used by Allan Flippin (San Jose, CA) to solve *Problem #24-1: Printing Permutations.* Wallace gives credit to Allan in his solution to this problem:

```
•1 REM ===================================
•2 REM    COMMODARES PROBLEM #55-3 :
•3 REM       UNJUMBLED WORDS
•4 REM    SOLUTION BY
•5 REM       WALLACE LEEKER
•6 REM    (BASED ON A SOLUTION TO
•7 REM   PROBLEM #24-1 BY ALLAN FLIPPIN)
•8 REM ===================================
•100 INPUT S$: N=LEN(S$): DIM C(N-1)
•110 I=N-1: PRINT S$,
•120 S$=LEFT$(S$,I-1)+RIGHT$(S$,N-I)+MID$
 (S$,I,1)
•130 C(I)=C(I)+1: IF C(I)<=N-I GOTO 110
•140 C(I)=0: IF I>1 THEN I=I-1: GOTO 120
```

Wallace modified Allan's solution so that it could handle letters instead of the numbers in the original problem. This is a very quick program. It handles words of any length.

It is much better than the more traditional solutions to this problem which use loops within loops to pick all the permutations.

The program is deceptively simple. You should "play computer" to see just how it steps through the character positions to build every possible string from the given string. Those jumbled word puzzles just won't be the same with this program available. Wallace suggests tying the output of this program into a spell-checker. That way only "real" words would be displayed. (Aren't back issues wonderful?)

The final challenge this month is *Problem #55-4: Polar Graphics* from Thomson Fung (San Diego, CA). You'll love some of the impressive graphics this problem produces. The problem is to write a program which plots a graph of the equation

```
R = 10 * T * COS(T) * SIN(T)
```

in polar coordinates. R is the distance of each point from the origin (0,0). T is the angle of a line from the origin to the given point.

All the solutions were for the C-128 or for the C-64 with Simons' BASIC or a comparable language with graphics capabilities. The solution requires the value of T to be incremented, the new value of R to be calculated from the formula, and then the Cartesian coordinates X and Y to be determined from R and T. The formulas for X and Y are very simple:

X = R * COS(T)
Y = R * SIN(T)

Wallace Leeker sent four variations on his solution:

```
·1 REM ===================================
·2 REM    COMMODARES PROBLEM #55-4 :
·3 REM      POLAR GRAPHICS
·4 REM    SOLUTION BY
·5 REM      WALLACE LEEKER
·6 REM ===================================
·10 GRAPHIC 1,1
·20 FOR T=0 TO 25.2 STEP .1
·30 R=10*T*COS(T)*SIN(T)
·40 X=INT(R*COS(T))+160
·50 Y=INT(R*SIN(T))+100
·60 DRAW 1,X,Y:NEXT T
```

This version plots individual dots at each (R,T) or (X,Y) position. The added 160 and 100 in lines 40 and 50 shift the origin to the middle of the screen. The result is a "Spirograph" type of butterfly pattern.

In one of his variations on this solution, W... line 60 to

```
60 DRAW 1,X,Y TO 160,100 : NEXT T
```

This generates rays outward from the origin. Another variation used these lines:

```
60 DRAW 1,X,Y TO X2,Y2
70 X2=X: Y2=Y: NEXT T
```

This solution produces smoother, curved lines. You should have fun trying other variations.

This solution from Jim Borden lets you specify the range and step size of T:

```
·1 REM ===================================
·2 REM    COMMODARES PROBLEM #55-4 :
·3 REM      POLAR GRAPHICS
·4 REM    SOLUTION BY
·5 REM      JIM BORDEN
·6 REM ===================================
·10 INPUT "START ANGLE, END ANGLE (RADS),
  STEP";SA,EA,SP
·20 GRAPHIC 1,1: FOR T=SA TO EA STEP SP:
 R=10*T*SIN(T)*COS(T)
·30 X=SIN(T)*R: Y=COS(T)*R: DRAW 1,X+160,
 Y+99
·40 NEXT: GETKEY A$: GRAPHIC CLR: IF A$<>
 "Q" GOTO 10
```

Use 0, 25.2, and .1 to get the same results as Wallace's program. Change the formula for R to get other types of patterns. Notice that pressing any key except "Q" will restart Jim's program.

C-64 users must implement a routine to plot the X and Y values given in the DRAW statements of these programs. Once again, back issues may come to your rescue. *Rupert Reports* in the June and July 1985 issues of *Ahoy!* provide usable pixel plotting routines.

That's it for this month. Keep those problems and solutions coming. Have fun with this month's challenges. ☐

The following readers not already mentioned sent valid solutions this month:

Ed Balow (Calumet City, IL)
Miguel Borges (St. John's, Newfoundland)
John Desclin (Brussels, Belgium)
George Gaudette (Lakeland, FL)
Keith Kushner (Brooklyn, NY)
H.G. Langston (Kissimmee, FL)
E. Lindsey
William Pfister (Camden, NY)
Norman Richards (Angleton, TX)
Larry Shafer (Westphalia, MI)
David Shobe (Lawrence, KS)
Richard van Frank (Montclair, NJ)
Rob Woods (Sherwood, OR)

FLOTSAM

Continued from page 23

This is being written to you from the other side of the earth. Kangaroo Island is 70 miles south of Adelaide in South Australia. The island is quite large–160 miles long by 60 miles wide, supporting about 4000 people.

I would like to thank you for a fine computer magazine. I have been a regular reader for the past 18 months and find that your programs are good.

I have two C-64s and two 1541s, one fitted with a Flash and one without. I have found the C-64 to be the most economical of all computers (though very slow, except when using the Flash). The C-128D is the most versatile I've used, though its 64 mode does not load the 100% of C-64 programs that we are led to believe. The CP/M mode is its most interesting aspect–it is unique in that it recognizes six other disk formats and shows the disk name and identification on the screen, and I've been able to copy public domain software from these other disks.

Your article in the March 1988 *Ahoy!* (we get our issues about two months late) on surge suppression was most interesting. Surge suppression arrived in South Australia this year in the form of a four-outlet power board which takes care of small surges in the power circuit, whether caused by the power supply or by light electrical equipment. However, major surges (or spikes) caused by refrigerators, air conditioners, pressure pumps, and the like override the power board, causing the computer to reset. The only thing I've found to control this type of surge is my printer (an Epson GX80 Commodore-compatible); when it's powered up, it absorbs the surge, protecting the computer and the program I'm working on. –Bill Jordan

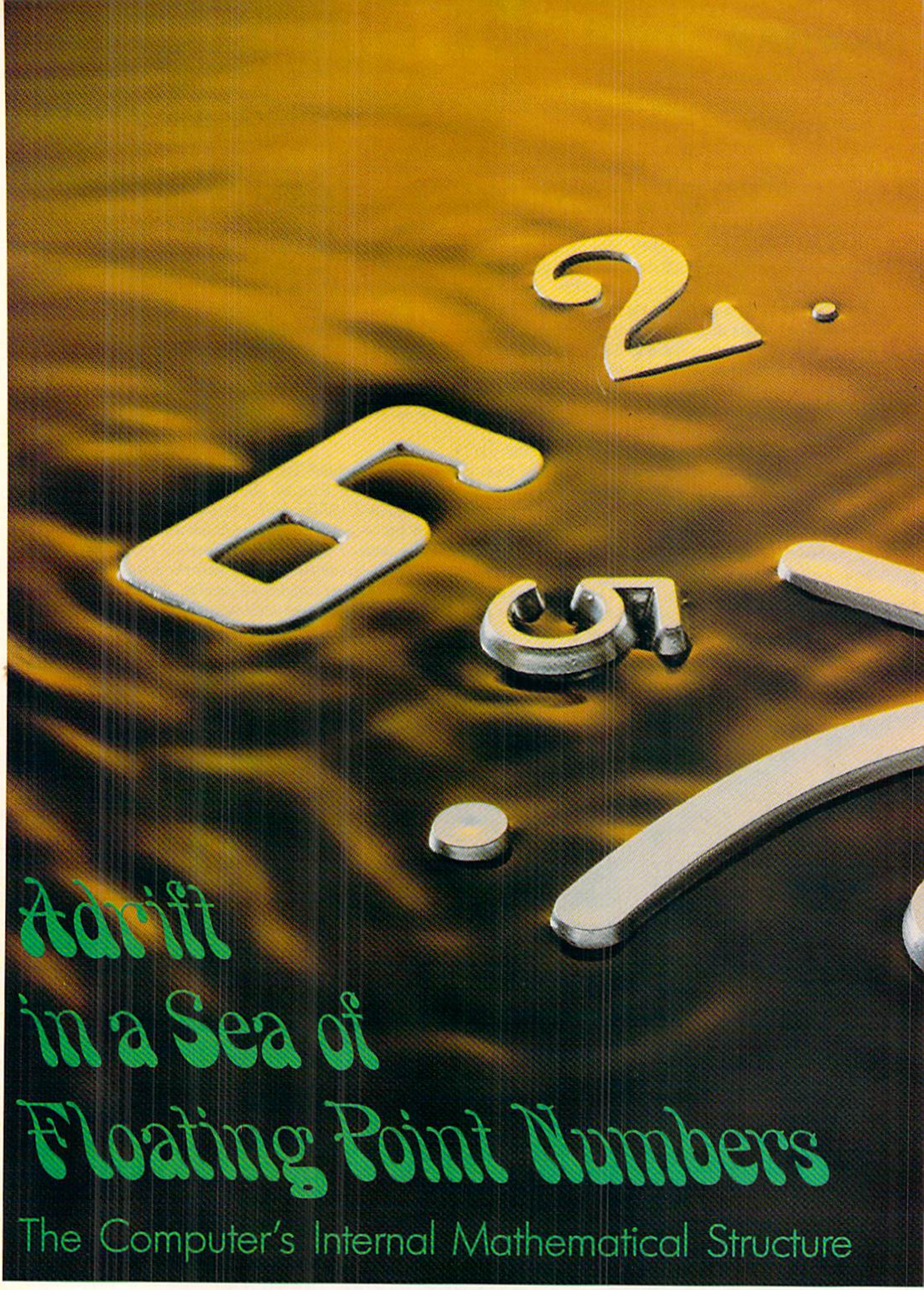
Penneshaw K.I., South Australia

Here's a good one for Commodares *(if not for Ripley's Believe It Or Not): what are the odds against our receiving two letters in two consecutive months from Kangaroo Island, South Australia? That's just what happened–with Murray Hansen's letter printed last month, followed by the above. Any more Kangaroo Islanders out there who'd like to make it three in a row?*

I recently cancelled my subscription to another computer magazine because they stopped publishing type-in programs. I own a C-64 and enjoy typing in your programs. Please keep *Ahoy!* the way it is, except for returning it to a 12 issue per year schedule. –J. Revis

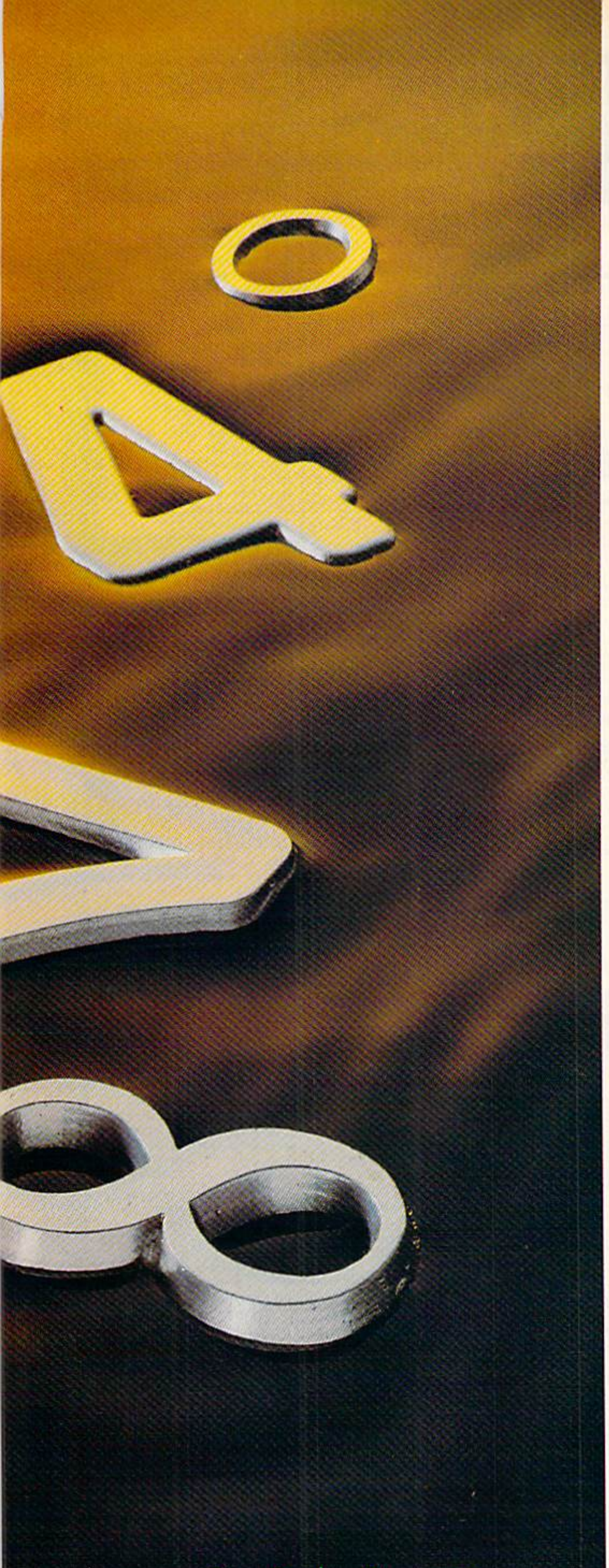
Bark River, MD

No one would like to see Ahoy! *return to monthly publication more than we. However, no such change is likely in the near future. Still, you should find some consolation in knowing that publishing fewer issues enables us to publish better issues. With 8 magazines to fill yearly instead of 12, we're able to include only the best of the best of the programs and articles we receive. Also, the extra time allows us to fine-tune each magazine to an extent that would not otherwise be possible.*



Adrift in a Sea of Floating Point Numbers

The Computer's Internal Mathematical Structure



By Dale Rupert

PHOTOGRAPHY © CHRISTOPHER GOULD 1988

RUPERT REPORT

The largest value your computer allows is the rather unusual number 1.70141183E+38. The smallest positive number that is distinguishable from 0 in the computer is 2.93873588E−39. How did the designers of the computer come up with these strange values?

We have discussed how integers are stored in the computer, but what about decimal fractions and numbers written in scientific notation? Why does the computer say that the square root of 36 does not equal 6 even though it displays both values as "6" on the screen?

To answer these questions and many more, we will dip into the complicated and confusing world of floating point numbers. When we are done, you will be able to better appreciate one of the most important and complex parts of the BASIC language.

Just to see that there is more to numbers in the computer than meets the eye, type these statements in direct mode:

```
A=6: B=SQR(36): PRINT A,B: IF A<>B THEN
PRINT "A AND B ARE NOT EQUAL"
```

The computer shows "6" for the values of A and B, but it also concludes that A and B are not equal. If we look into the way that A and B are stored, this is what we see:

```
A: 131 64 0 0 0
B: 131 64 0 0 1
```

Clearly A and B are different inside the computer. But how do we interpret this strange format where the simple number "6" is stored in five bytes as "131 64 0 0 0"?

STRANGE FORMAT

All numbers assigned to numeric (non-integer) variables in BASIC are stored in a floating point format which might be described as "4-byte normalized mantissa with two's complement most significant bit and 1-byte excess-128 exponent." If that rather scary-sounding bunch of terminology bothers you, a simplified example of floating point number storage will show that there is nothing to worry about.

Start with a number written in standard scientific notation: 4 x 10^3. This quantity may be expressed in BASIC as 4E3, 0.4E4, 40E2, or in various other ways, all equivalent to the number 4000. "E" stands for the words "times ten raised to the power." One way to interpreting "E" is to think "move the decimal point over this many places." To evaluate 0.4E4 for example, write 0.4 as 0.40000 (use as many 0s as you want), then move the decimal point four places to the right, giving 4000.0.

The number following the "E" is called the "exponent" and the number preceding the "E" is called the "mantissa." The number 10 is called the "base."

Every real number can be expressed as a *mantissa* times a *base* raised to an *exponent.*

It is convenient to adjust or "normalize" the mantissa to

be a decimal fraction greater than or equal to 0.1 and less than 1.0. The exponent can then be adjusted to compensate. For example, 4000 written in normalized form is 0.4E4 since the mantissa is between 0.1 and 1. Other forms such as 40E2, 400E1, and 4000E0 all have the same value, but they are unnormalized.

Here are some other values and their normalized floating point representation:

123 = 0.123E3	54.321 = 0.54321E2
0.5 = 0.5E0	6 = 0.6E1
0.05 = 0.5E−1	0.00064 = 0.64E−3

Notice that the last two examples have negative exponents. A negative exponent is interpreted as "move the decimal point to the *left* by this many places." Thus 0.64E−3 can be written 0000.64E−3 (add as many 0s as desired), and then "E−3" says to move the decimal point 3 places to the left, giving 0.00064.

Now we have seen that there is nothing very mystifying about the concepts of mantissa, base, exponent, and normalization. Is there any number that can't be written in this floating point format? If the exponent can be a number of any size, the answer is "No, any number can be written in floating point format."

Negative numbers are written with a negative mantissa. Don't confuse a negative mantissa (meaning "the number is less than 0") with a negative exponent (meaning "move the decimal point left").

The power of floating point representation is that a very wide range of values can be stored in a limited amount of space. Compare the number 1,000,000,000 with its normalized floating point equivalent of 0.1E6. Square that number to get 1,000,000,000,000 which can be expressed as a compact 0.1E12. Cube that result to get 1 followed by 36 zeros which can be shown tidily as 0.1E36.

For small numbers very close to zero, there is a similar storage advantage. The distance between circuit lines in the microcircuits of some computers is 2 microns (or less). This is 2 millionths of a meter written as 0.000 002 meter. In normalized floating point representation, this is a compact 0.2E−5.

Floating point notation is more powerful than "fixed point" notation. In fixed point notation, only a certain number of digits are allowed to the right of the decimal point. If that number is 2, for example, the quantity 123.2345 is stored as 123.23. Any digits beyond the second decimal digit are rounded off or truncated.

The disadvantage of fixed point storage is that the smallest positive number which can be represented is 0.01 (for 2-place fixed point format). Any smaller number such as 0.0032 becomes just 0.00. Floating point notation might limit the number of decimal digits to 2 also, but it is still able to represent very small values: 0.0032 could be stored as 0.32E−2.

BINARY REALM

We all know that computers store their information as binary numbers, using only 0s and 1s. Binary is another name for the "base 2" number system. It might be expected then that floating point storage in the computer uses a base of 2 rather than the base of 10 in the previous examples. In fact, that is true. Numbers are stored in the computer in normalized, base-2 format.

Probably most readers are already familiar with binary integers: 1101 in base 2 (written 1101_2) equals 13 in base 10, $11111111_2 = 255_{10}$, and so forth. Each digit corresponds to a certain power of 2 in the binary number system just as each digit corresponds to a power of 10 (its "place value") in a decimal number.

Just as we may think of the decimal number as "1 in the 1000's place + 5 in the 100's place + 0 in the 10's place + 4 in the 1's place," the binary number 1101 stands for "1 in the 8's place + 1 in the 4's place + 0 in the 2's place + 1 in the 1's place." Calculating (1*8 + 1*4 + 0*2 + 1*1) gives the decimal equivalent 13.

So much for whole numbers. What about fractions? How is the decimal fraction 0.5 represented as a binary number? Very simply, 0.5 in decimal = 0.1 in binary. Again it all depends upon place values. The first digit to the right of the decimal point in base ten represents tenths, the second digit represents hundredths, and so forth. In the binary system, the first digit to the right of the "binary point" (or "radix point" – the more general term) represents halves, the next digit is 4ths, the next is 8ths, then 16ths, and so on.

The binary fraction 0.1101 may be interpreted this way:

$$0.1101_2 = 1*(1/2) + 1*(1/4) + 0*(1/8) + 1*(1/16)$$
$$= 0.5 + 0.25 + 0 + 0.0625$$
$$= 0.8125 \text{ in decimal}$$

There is another way to convert a binary fraction into its decimal equivalent. Just as we might read the decimal fraction 0.058 as "58 thousandths", we could interpret the binary fraction 0.1101 as "13 sixteenths" since 1101_2 is 13 and the furthest digit to the right in 0.1101 is in the 16ths place. If we convert 13/16 into a decimal by dividing, we get the previous result 0.8125.

TAKE A BYTE

Not only is the computer binary-oriented, it is byte-oriented, where a byte is a group of 8 binary digits. Binary fractions in the computer are most easily handled in byte format. Consider the binary fraction 0.11010001. Again we could convert it to decimal bit by bit:

$$0.11010001_2 = 1*(1/2) + 1*(1/4) + 0*(1/8) + 1*(1/16) + 0*(1/32) + 0*(1/64) + 0*(1/128) + 1*(1/256)$$
$$= 0.81640625$$

Using the other method, take the binary integer 11010001 which is 209 in decimal. Divide it by 256 (since the bit furthest to the right in the original binary fraction is in the 256th's place) giving 209/256 or 0.81640625, just as above:

$$0.11010001_2 = 11010001_2 / 256 = 209/256 = 0.81640625$$

209 comes from the fact that the left-most bit in the byte is 128, so 11010001_2 equals 1*128 + 1*64 + 0*32 + 1*16 + 0*8 + 0*4 + 0*2 + 1*1 which is 209.

CONVERTING A FLOATING-POINT NUMBER INTO ITS INTERNALLY STORED FORMAT

Consider 10.234. Here is how to calculate the floating-point representation of this value.

1. Divide by 2 repeatedly until the quotient is between 0.1 and 1:

```
 10.234 / 2 = 5.117
  5.117 / 2 = 2.5585
 2.5585 / 2 = 1.27925
1.27925 / 2 = 0.639625
```

Since this took 4 divisions, our exponent will be 4. Convert the exponent to excess-128 format:

Exponent = 4 + 128 = 132

2. Multiply the last quotient by 256:

0.639625 * 256 = 163.744

Take the integer part of this number (163) as the MSB of the mantissa. But first subtract 128 from it (since it is greater than or equal to 128 and since our original number 10.234 is positive):

Mantissa MSB = 163 − 128 = 35

3. Take the fractional part of the previous product (0.744) and multiply by 256:

0.744 * 256 = 190.464

The next MSB of the mantissa is the inteter part of this result:

Mantissa byte 2 = 190

4. Repeat Step 3 two more times to get the last two bytes of the mantissa:

0.464 * 256 = 118.784

Mantissa byte 3 = 118

0.784 * 256 = 200.704

Round this final value to the nearest integer (201) to get the least significant byte of the mantissa:

Mantissa LSB = 201

5. The number 10.234 will be stored in the computer as

132 35 190 118 201

You can verify this result with the program *Floating Point Converter.*

We need one more example before we see how all of this is related to floating point storage in BASIC. We saw that normalizing a decimal fraction meant moving the decimal point so that it was just to the left of the most significant digit of the mantissa. This movement was compensated by changing the size of the exponent. An analogous process is used to normalize a binary fraction.

Consider the decimal number 209. Here is how it could be represented as a normalized, binary floating point value:

1) Write 209 as a binary number times a power of 2:

209 = 11010001_2 * 2 ↑ 0 (since 2 ↑ 0 is 1)
= 11010001.E0 (now E stands for "* 2 ↑")

2) Move the radix point to the left of the left-most nonzero bit (move it 8 places to the left):

.11010001

3) Compensate for that move by increasing the exponent by 8:

.11010001E8

To check our results, take the binary fraction 0.11010001 and multiply it by 2 ↑ 8. We saw earlier that 0.11010001 is 0.81640625 and we know that 2 ↑ 8 is 256. Sure enough, 0.81640625 * 256 = 209. Alternately 0.11010001 is 209/256, and 209/256 * 256 is 209. We lost nothing in translation.

INTO THE DEPTHS

If you have made it this far, the worst is behind. With an understanding of binary fractions and normalization, we can now look at numbers stored in floating point form in the computer.

We will discuss the program *Floating Point Converter* (see page 64). This program PEEKs at the data stored in a floating point variable so that we can see the computer's internal representation of any number. The program also allows you to put data values directly into memory and see how the computer interprets them as a floating point quantity.

The program looks into the memory location where the first variable defined in the program is stored. That memory location is found from the "start of variables pointer." This pointer is a 2-byte number stored at addresses 47 and 48 in the C-128 and at 45 and 46 in the C-64. Line 70 determines which computer is being used. Line 80 selects the proper value for the starting address of the pointer.

Line 90 converts the 2-byte pointer into a memory address using the standard formula:

Address = (pointer's 1st byte) + 256*(pointer's 2nd byte)

This address is where the first variable of the program resides. Each variable is allocated 7 bytes of memory. The storage format for floating point variables looks like the chart at the top of the next column.

Each variable may have a 2 character name (only the first 2 characters are significant anyway). These characters are stored in Name1 and Name2. If the variable has a single

character name, that character is stored in Namel and 0 is stored in Name2.

Byte	Contents	Byte	Contents
1	Namel	5	Mant2
2	Name2	6	Mant3
3	Exponent	7	Mant4
4	Mantl		

The remaining 5 bytes are the exponent and mantissa of the variable's floating point value. Each byte may have a value from 0 to 255. The exponent is stored as an "excess 128" value which means very simply that 128 has been added to the actual value. The smallest exponent which can be represented here is −128 which is stored as the quantity 0. The largest exponent allowed is +127 which is stored as 255. Remember that these exponents are powers of 2.

The mantissa is normalized and stored as four bytes. There is just one more complication, however. Since the mantissa has been normalized (the radix point is shifted so it is just to the left of the left-most, non-zero bit), we know that the left-most bit is always a 1.

Here's where some *incredible* reasoning comes into play. Read carefully. We know that the exponent has been adjusted so that the left-most bit of the mantissa is always a 1, and therefore, (are you ready for this?) we don't actually need to store a 1 there in the left-most bit of the mantissa. In fact, that bit is used to indicate whether the mantissa is positive or negative.

If the mantissa is negative, a 1 is stored in the left-most bit. If the mantissa is positive, a 0 is stored in the left-most bit. Regardless of what is stored in the left-most bit, we know (at least the computer knows) the value of that bit is always a 1. By seeing what is actually stored for that bit, we also know the sign of the mantissa. Pretty neat, eh?

BACK TO THE PROGRAM

We now know how data is stored in floating point variables. Let's see how the program *Floating Point Converter* reads and displays the data. The exponent and 4 mantissa bytes for the variable X0 are at addresses S1 and S2 through S5. Line 260 PEEKs at those addresses (in BANK 1 for the C-128) to see the values stored there. The 5 bytes are stored in V1 through V5.

The routine at line 1010 prints those 5 bytes and interprets them. The exponent is calculated from V1 by subtracting the "excess 128" in line 1030. The mantissa is calculated from the other 4 bytes in line 1040. V2 stores the left-most byte of the mantissa. Remember that its left-most bit should always be 1. The statement (128 OR V2) sets the bit to 1 regardless of its actual value.

We have already seen that the first mantissa byte may be thought of as a number of 256ths. The second mantissa byte is in the $(1/256)^2$ position. Similarly the third and fourth mantissa bytes represent the number of $(1/256)^3$'s and $(1/256)^4$'s.

Line 1040 shows an efficient way to calculating the actual value of the mantissa. The least significant byte V5 is first divided by 256. The next least significant byte V4 is added, and the quantity is again divided by 256. Now V5 is effectively been divided by 256^2. Next V3 is added and the quantity is divided once more by 256. Finally the corrected most-significant mantissa byte V2 is added and the quantity is divided by 256.

You may do some algebraic tinkering to convince yourself that MN in line 1040 now stores the value:

$$\frac{V2}{256} + \frac{V3}{256^2} + \frac{V4}{256^3} + \frac{V5}{256^4}$$

This is analogous to our earlier example in binary where 0.1101_2 was converted to decimal by dividing each digit by its place value:

$$\tfrac{1}{2} + \tfrac{1}{4} + 0/8 + 1/16 = \tfrac{1}{2} + \tfrac{1}{2^2} + 0/2^3 + \tfrac{1}{2^4}$$

Line 1050 determines the sign SN of the mantissa by checking the value of the most significant byte (MSB). The MSB of V2 is greater than or equal to 128 only if its most significant bit equals 1. Thus all negative mantissas have a value of V2 greater than or equal to 128, and all positive mantissas have V2 less than 128.

Line 1060 displays the calculated sign, mantissa, and exponent and then shows the actual value of the variable X0. The program does not actually perform the calculation of SN*MN*2 EX because multiplication and exponentiation round off errors limit the accuracy of the results. You may add the statements to display the results of that calculation

if you like.

If you press X at the prompt, the program switches to the value entry mode. In this mode, you may specify the 5 bytes to be stored for the variable X0. The same routine at line 1010 then converts those values to exponent/mantissa format. You will see that slightly changing the 5th byte (V5) may not change the displayed value of X0. Several different internal values are all displayed the same way on the screen.

For example, let's see how SQR(36) differs from 6. Line 20 in the program defines X0 to be the square root of 36. If you just press the RETURN key the first time you run the program, X0 retains that value. The bytes stored for SQR(36) are shown to be:

131 64 0 0 1

Now enter 6 at the prompt and see that the number 6 is stored as:

131 64 0 0 0

A difference of 1 in the least significant byte is not significant for the screen display. When the computer compares 6 with SQR(36), however, the difference is significant.

Now press X to switch modes. Enter values 131, 64, 0, 0, 2. This quantity is displayed on the screen as 6.00000001. Experiment with other values and see how sensitive the displayed value is to changes in the internal values.

To wrap it all up, let's analyze the results of X0 equal to SQR(36) just to make sure you understand what is being shown by this program. Once again, the internal values for SQR(36) are 131, 64, 0, 0, 1. The exponent is 131 minus 128 which is 3. The MSB of the mantissa is 64 which is 0100 0000 in binary. Remember that the left-most bit of this byte is *assumed* to be 1. The fact that it is actually 0 means that we have a positive mantissa.

Change the left-most bit of this byte to 1 giving 1100 0000 which is 192 in decimal. Now calculate the mantissa using the displayed values from right to left:

$$\text{mantissa} = (((1/256 + 0)/256 + 0)/256 + 192)/256$$

or

$$\begin{aligned}\text{mantissa} &= 1/256^4 + 192/256 \\ &= 1/4294967296 + 192/256 \\ &= 0.750\ 000\ 000\ 233\end{aligned}$$

Next multiply this mantissa by 2 raised to the 3rd power:

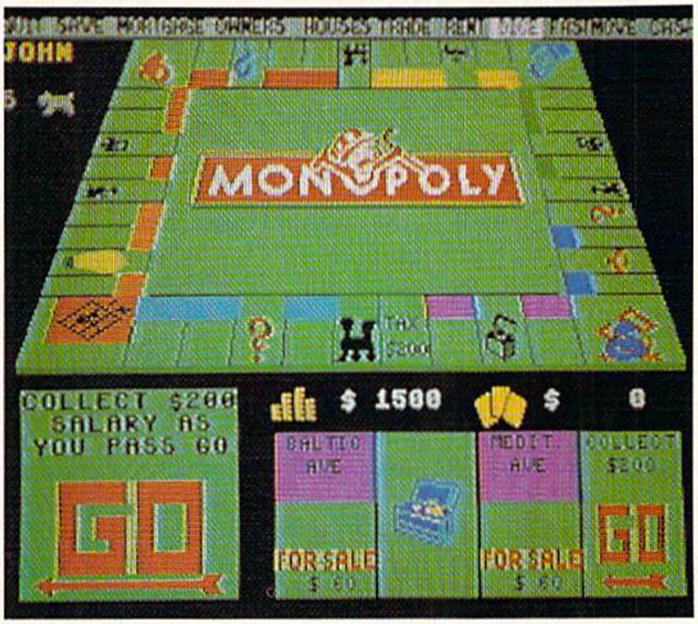
$$\begin{aligned}\text{result} &= 0.750\ 000\ 000\ 233 * 2^3 \\ &= 6.000\ 000\ 001\ 86 \\ &= 6 \text{ (rounded to 9 significant figures)}\end{aligned}$$

Hopefully by experimenting with other numbers, you will better understand and more fully appreciate the internal mathematical structure of BASIC. Enter these values into the program to see why 1.70141183E38 is the largest allowed value, and 2.93873588E−39 is the smallest. The next time someone tells you that computers never make mistakes, show them our first example and explain why the computer thinks the square root of 36 does not equal 6. Computers can certainly *appear* to make mistakes if we don't recognize their limitations and don't understand their internal operations. □

SEE PROGRAM LISTING ON PAGE 64

REVIEWS

METROCROSS
Epyx
Commodore 64
Disk; $24.95



Computer Monopoly *is played just like the original, with the advantages of onscreen prompts to guide players through the game, and the computer's help in making money and real estate transactions.*

This jaunty 1985 Namco design features an imaginative obstacle course beneath an unnamed city. It's a race against time that should challenge even arcade aces.

The joystick or keyboard controls a commuter, depicted in modified side perspective. The animated cartoon figure leaps barriers, slides on the green slime tiles, and vaults over the rolling red cans as seconds tick away on the counter located below the active playfield.

If the commuter reaches the goalposts at the end of the horizontally scrolling subway tunnel before time



Metrocross *features an imaginative obstacle course under an unnamed city.*

elapses, the player advances to the next one. A cute sequence in which the character huffs and puffs after successfully completing a level also allows the computerist to get ready for the next, even more difficult round.

The commuter gets help from several sources in the frantic footrace against the clock. Skateboards are a superior form of transportation, and the springboards offer the character a quick trip through the air.

Kicking a blue can earn a bonus score, but stomping one is an even better strategy. It temporarily stops the clock and gives the player two precious additional seconds.

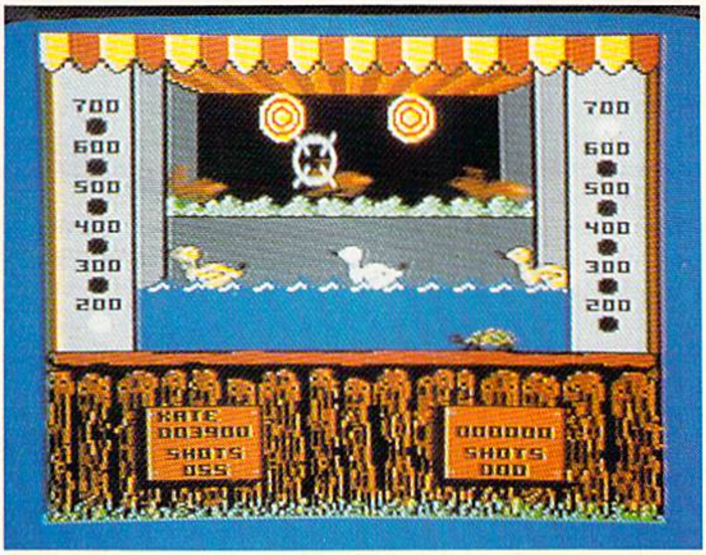
Jumping on a green can has the same time-delaying effect, but kicking one increases the commuter's speed for five seconds. Sometimes, faster movement is worth more than the extra seconds.

The logic of the situation is paper thin, but *Metrocross* is so much fun that most joystick jockeys won't care. The documentation doesn't really attempt to provide a rationale for all the cans and skateboards and surplus track and field hurdles. It's just as well. *Metrocross*, the first title in Epyx's new U.S. Gold line, is best enjoyed with a light heart and an empty mind.

The biggest objection, however, concerns the failure to adjust the game for the U.S. market. The only thing more frustrating than a "high score" screen which doesn't retain the computerist's best performances between sessions is a vanity board which permanently saves only the miscellaneous names and scores which the programmers coded into the product before purchase. I make no promises of good behavior if I run into "Brian" who is credited with a score of 100,000 on my disk.

Fine-tuning the increase in difficulty between levels is another change which would make *Metrocross* better for the home gaming audience. Adults may find it hard to make progress in this demanding action contest.

Those who can cope with the physical requirements are in for a treat. *Metrocross* will give your joystick or key-



Clubhouse Sports *simulates six arcade amusements from the pre-video-game era. The games attempt to reproduce what the gamer would see if he were actually playing these contests.*

board fingers a terrific workout.

Epyx, 600 Galveston Dr., P.O. Box 8020, Redwood City, CA 94063 (phone: 415-366-0606). *–Arnie Katz*

Circle #179 on Reader Service Card

MONOPOLY
Leisure Genius
Commodore 64
Disk; $29.95

America's most enduringly popular board game is *Monopoly.* It has literally enthralled the world since Parker Brothers purchased the rights in 1935. The board game is currently published in 29 countries and translated into 22 foreign languages. There's hardly a family that doesn't own a set; there are hardly any of us who don't fondly recall marathon playing sessions around the kitchen table.

Leisure Genius' computer edition of *Monopoly* recalls those family games with the same warmth of heart, then adds its own brand of ruthless gusto that would do everyone's Brother Ed proud. If you think the *Monopoly* players at your family gatherings were tough, just wait until you play against the computer!

Computer *Monopoly* is played exactly like the boardgame; there are no sacrifices or abridgements of the standard rules. Two to eight players can participate, and these can be all human, all computer, or any combination of humans and computer opponents. Regardless of the mix of players, the bank always takes over the money-changing details, including monitoring all property transactions.

Onscreen prompts guide the user through the game. After a handsome title screen and a view of the standard *Monopoly* board, the computerist enters the number and name of each player in the game, whether or not each position is managed by the computer, and then selects the playing tokens. These are the old familiar icons: flatiron, dog, motor car, thimble, shoe, hat, wheelbarrow, and cowboy.

Next the computerist either chooses to play the standard, full-length game, or sets a time limit for a shortened version.

Gamers control play with joystick, cursor keys, or keyboard. An option bar runs across the top of the screen, and by highlighting these commands, the gamer can quit, save the game, mortgage property, see what property is owned by each player, buy houses, collect rent, throw the dice, or show how much cash each player has. The final selection is Fastmove; use of this option speeds up each person's playing time.

Play is logical, and semi-automatic. Positions played by the computer are handled very speedily, almost too quickly for a human monitor to keep up. When a human competitor is on deck, action only proceeds when the player hits the RETURN key.

The name of the current player is displayed to the left of the full-sized board with a picture of the applicable token. The player moves the cursor along the option bar at the top of the screen to highlight Dice. This activates two nicely articulated dice, shown tumbling in the lower lefthand corner.

After the dice roll, the player's token scoots the proper number of spaces along the board before coming to rest in its new location. The four pieces of property surrounding the player's position are depicted full sized in the lower right corner, each with a banner across its face indicating if it's still for sale, sold, mortgaged, or has houses or hotels.

An onscreen prompt inquires if the player wants to buy the property, if it's available. If so, the computer automatically makes the sale, and takes care of the money and accounting chores. If the property belongs to one of the others, the onscreen prompt tells how much rent is owed and to whom, then deducts that amount of money from the player's stash. The amount of cash available for use and the property that player owns are also shown onscreen for instant reference.

Before the player surrenders the dice, he or she can offer trades, make loans, or develop property. When the player finishes the turn, highlighting Dice and pressing RETURN starts the next player's turn.

The graphics are extremely attractive, and help protect the old-fashioned feeling of *Monopoly.* The board, depicted in two-thirds perspective, is true to its origins. When each player's token comes to life and slides around the board, the trip is enhanced by pleasant sound effects, like the policeman's whistle, bells that chime when you pass Go, and locomotive sounds for each of the four railroads.

In fact, the only real flaw with the computer edition of *Monopoly* is that it doesn't come packed with live people, instead of its computer robot players. The computer plays a hard-hearted game, adhering strictly to the rules. Until you play a computerized game, you probably won't realize just how much of the fun of *Monopoly* comes from the family or group of friends. The game loses something if Little Sister isn't there wheedling her way into an overly generous loan from the bank, or if Cousin Earl isn't making an under-the-table arrangement with Uncle Buck to take over the world. Without the family fun, it's a cold game–and also a fairly quick one. If one human plays against several computerized opponents, the game races along at a breakneck speed, going through all of its phases with no human input, so that it's practically impossible to keep up with the action.

Monopoly is a wonderful game, and this computerized edition is a true and faithful rendition. No one who loves the game should be without this, since it provides a good way to get up a game, even when the kitchen is empty of family and friends. But, when the house fills up with familiar faces, the game should be moved back to the tabletop, for that's still the place where it's the most fun for everyone.

Leisure Genius/Electronic Arts, 1820 Gateway Dr., San Mateo, CA 94404 (phone: 415-571-7171). *–Joyce Worley*

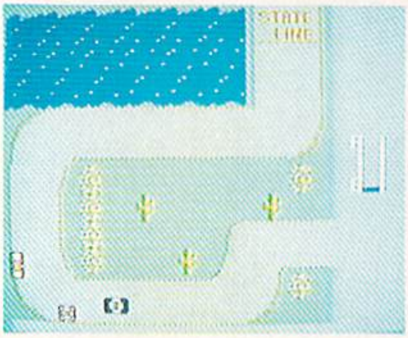
Circle #178 on Reader Service Card

CLUBHOUSE SPORTS
Mindscape
Commodore 64
Disk; $29.95

Nobody gives computer game players value for their dollar like Ed Ringler. In 1987, Ed's DesignStar Consultants brought us the groundbreaking *Superstar Indoor Sports,* with its quartet of Air Hockey, Darts, Bowling, and Ping Pong simulations. Any of these smartly executed games might have been released on its own without a murmur of discontent from consumers, but DesignStar and Mindscape nobly opted to package the four into one of the most successful omnibus en-



Like some previous Datasoft titles, **Cosmic Relief** *mixes action with elements from role-playing adventures to form a new kind of entertainment that requires mental as well as physical dexterity.*



Stocker's *overhead view is like a blast from video/computer gaming's past.*

tertainment products ever.

This year's model is called *Clubhouse Sports* and includes an amazing *six* simulations of classic arcade amusements from the pre-videogame era: Pinball, Billiards, Skeeball, Shooting Gallery, Crazy Pool, and Foosball. Up to four players can compete in any or all of the contests, with top scores stored to memory on each game's vanity board.

As with *Indoor Sports*, the games of *Clubhouse Sports* share a visual orientation that attempts to reproduce what the gamer would see if he were actually playing these contests. Unfortunately, some of these games are not optimized by this viewpoint.

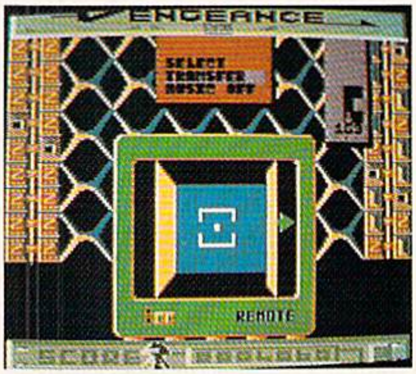
In Pinball the novelty of seeing the table from a true player's perspective does have appeal. It allows the user to realistically integrate tilting into the gameplay, for example. But before long the lack of an overhead view is sorely missed. This presentation limits the amount of space available for table graphics, resulting in a much too simple board. There are only *two* bumpers, both at the top of the table, and just one pair of flippers, where a second set was clearly called for.

The visually compelling display is full of compromises. The ball does not in any way suggest a pinball. When seen from the farthest point, at the top of the table, it resembles a ping pong ball. By the time it reaches the flipper area it has swollen to baseball size, giving the entire game an outsized, nonproportional look.

Continuity is a nice thing, and the conceit that we are in a computerized clubhouse, playing all the games from the same perspective, is very endearing. But it simply does not make sense to hammer a square peg into a round hole. Pinball should have been one of this package's hottest entries. Instead it plays like a clever idea that didn't pan out as a satisfying game.

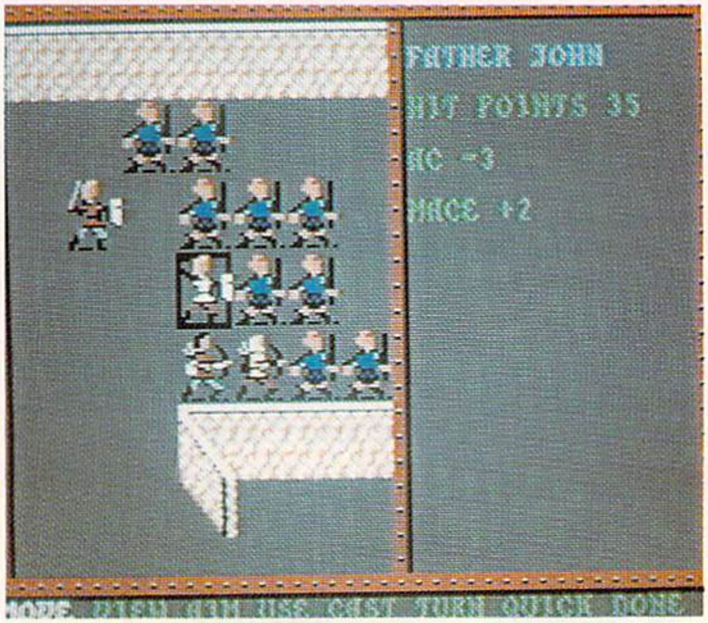
The player's-eye-view perspective *does* work on Foosball, however, making this the surprise pick of the litter. Foosball is a form of table soccer in which two gamers manipulate a series of rods containing plastic players to make up six-man teams.

Clubhouse Sports' computer version of this neglected classic simplifies the one play element that could cause difficulty: alternating control from rod to rod. The potential problem is nicely sidestepped by having the computer automatically activate the appropriate rod depending on the position of the ball.



Alien Destruction Set *is four action games with a shared sci-fi theme.*

In **Pool of Radiance** *as in other games, you create characters, form them into a party, and send them into the world to encounter monsters, magic, and treasure, whereby they rise in level and power.*



Circle #123 on Reader Service Card

Skeeball is the next best of the six entries. This venerable variation on bowling lets the player roll a ball down an alley with an upward tilt at its far end. This lip acts as a launch pad for the rolling ball which must attain some loft in order to hit the target: a series of segmented concentric circles with point values that increase toward the center.

The user has full access to a detailed series of player options. In Skeeball, the user can play solo, contest with a variably skilled computer opponent, play against the clock, or play with a preset number of balls. The ball is aimed with a cursor set to provide automatic resistance to the bullseye (the closer the cursor comes to center screen, the greater the force which pushes it away). This game works just fine, recreating the simplicity and fascination of this arcade favorite.

The shooting gallery, while no eye-popper, is a pleasant diversion. The user targets the pop-up ducks, bunnies, and bullseyes through a joystick-controlled crosshairs cursor and fires by pressing the action button. There are four levels of depth to this target gallery, ranging from the turtles creeping slowly along the bottom foreground to the flying ducks and drop-targets in the background.

The two pool table games, Billiards and Crazy Pool, are minor disappointments. Again, the viewpoint takes much of the blame. In both games, the table is seen from a two-thirds perspective with the short sides at the top and bottom of the screen. This unyielding viewpoint forces the player to set up every shot from the same position, which is simply *not* the way such games are played. As with Pinball, an overhead view would have made a lot of sense here.

Clubhouse Sports is a great value, make no mistake, but this collection is inferior to *Indoor Sports*. Some of the games in this newer package look like leftovers – ideas that didn't make the first cut and so showed up here hoping to find strength in numbers. It is recommended, but don't set your expectations too high.

Mindscape, 3444 Dundee Rd., Northbrook, IL 60062 (phone: 312-480-7667). *–Bill Kunkel*

Circle #173 on Reader Service Card

COSMIC RELIEF: PROF. RENEGADE TO THE RESCUE

Datasoft
Commodore 64
Disk; $24.95

Cosmic Relief is an action-adventure with the backdrops and characters from one of those world-spanning Victorian science fiction novels full of improbable inventions and all kinds of eccentric characters.

Although created in England by Teque Software Development Ltd., *Cosmic Relief* represents the logical evolution of the action-adventure format pioneered by Datasoft in games from *Conan the Barbarian* to *The Goonies*. These games mix straight-ahead action with elements from role-playing adventures to form a new kind of entertainment that requires mental as well as physical dexterity. *Cosmic Relief* has that same mix of physical puzzles and arcade-style action, but adds elements of camp comedy and surreal science-fantasy. These additions clearly improve the recipe.

The story goes like this: Forty years before the game begins, Professor K.K. Renegade predicted an asteroid would hurtle toward Earth and eventually destroy our beloved planet. When nothing happened, however, the Prof. was subjected to ridicule and censure. Feeling basically unappreciated, he took off for parts unknown, and no one has seen him since.

Now it's forty years later, and guess what? Yep, here comes that asteroid! And, believe it or not, people actually *remember* the old crackpot who predicted it almost half a century earlier! Totally at a loss as to what to do, the citizenry logically concludes that Prof. Renegade must be found, apologized to, and set to the task of saving us in spite of our shortsighted selves.

This task is in the lap of the user, who must choose one of five soldiers of fortune to represent him on his search for Prof. Renegade. There's the robust Brit, Fortisque Smythe, master of many skills but something of a self-promoter. Big John Caine is a burly, fresh-faced Yankee; Wu Pong, a famed Japanese adventurer; Herr Krusche, a valiant German explorer; and Henri Beaucoup, a world-renowned French daredevil. Though their differences are largely cosmetic, each has a specific object within the game that is his personal key to locating Renegade.

As the player surrogate moves around the multidirectional scrolling playfield, he encounters a series of objects left behind by previous unsuccessful expeditions. These range from the wacky to the whimsical and include a flying vacuum cleaner, a magical flute (especially helpful for mellowing out snakes), and a coat hanger that turns out to be good for more than keeping one's jacket unwrinkled!

The player can carry multiple objects thanks to offscreen native bearers. At any time, the player can access the inventory of either bearer in order to exchange items.

The game also accesses a T (Think) command when the user is stuck. The onscreen player will then think about the item he needs to get past the logjam. This item is visualized in a thought balloon above the hero's head.

If the player gets *really* desperate, there's a map and cheat sheet packed with the game that reveals the purpose

of every object and the key item for each onscreen surrogate.

The playfield contains the visual display and a data area across the bottom third of the screen. This strip lists current and high scores, the day and time (the player has only 30 days to construct an asteroid deflector), and a visual inventory.

The only real problem is that many of the items are not easily identified due to occasional lapses in the artwork. For example, the basket to which the player must affix a hot air balloon looks disarmingly like a toilet bowl!

Cosmic Relief: Prof. Renegade to the Rescue is an amusing and engaging entertainment that piques the intelligence while challenging the motor skills of the user.

Datasoft, 19808 Nordhoff Place, Chatsworth, CA 91311 (phone: 818-886-5922). *—Bill Kunkel*

Circle #174 on Reader Service Card

POOL OF RADIANCE
Strategic Simulations
Commodore 64
Four double-sided disks; $39.95

This mammoth fantasy role playing game (RPG) is the first title SSI has published under its license from TSR, creators of the trailblazing "Dungeons & Dragons." It is derived from the campaign module of the same name which TSR produced for the pencil-and-paper "Advanced Dungeons & Dragons," a sophisticated revision of Gygax and Arneson's basic rules.

The usual horde of monsters has overrun the fabled city of Phlan, located in the North of the Forgotten Realms. The computerist creates a band of adventurers which battles the creatures and their mysterious leader. Although the player must repulse the monster army and restore Phlan to its former glory to win, running questing parties with no larger goal in view provides hours of entertainment.

It is difficult to assess this product's originality. Whose fault is it that *Pool of Radiance* precisely simulates the game, "Advanced Dungeons & Dragons," which inspired a dozen earlier role playing disks? It is undeniably similar to *Wizardry, The Bard's Tale, Might & Magic, Alternate Reality,* and all the other programs which "borrowed" experience points, character level, moral alignment, and much more from "Advanced Dungeons & Dragons." The main difference is that *Pool of Radiance* officially and unambiguously acknowledges the source of its play mechanics and rules structure.

As in other computer RPGs, the player creates characters, forms them into a party, and sends it into the world to gain experience through encounters with monsters, magic, and treasure. As characters accumulate experience, they rise in level and acquire greater power. A party with sufficient power can defeat the monsters and liberate Phlan.

Veteran computer role playing gamers will find the "quick start" card supplied with *Pool of Radiance* enough to get going. For those who require a fuller explanation, SSI provides a lucid rules manual and a separate book of background information about the Forgotten Realms.

Everything works off menus, and there are plenty of onscreen prompts to coach the solitaire Commodore owner through the multipart turn. Frequent disk-switching disrupts the smooth flow of events, but it is unavoidable in a game of this scope and complexity.

The main display screen gives the armor class and hit points of each party member and presents a drawing of the current location. The illustrations are colorful and animated, but they are not quite as slick as in *Bard's Tale II* and *III.* A complete report on each character in the party is also available on subsidiary screens.

Pool of Radiance does, however, introduce a few novel elements. The biggest change involves non-player characters (NPCs), which electronic RPGs have hitherto ignored. A party can talk to NPCs and ask them to join the group. Of course, it is sometimes difficult to gauge the loyalty of strangers, and seemingly docile creatures may turn traitor if they don't receive proper treatment.

A major innovation is the tactical battle display. During combat, a close-up of the engagement replaces the main screen. This system is much more satisfying than abstract summaries. The computerist actually sees each individual character move, cast spells, deliver sword blows, and take damage from attacks.

Pool of Radiance is an impressive beginning for this series of adventures set in the Forgotten Realms. It is hard to imagine anyone who likes fantasy role playing games who would not enjoy an electronic trip to the beleaguered city of Phlan.

Strategic Simulations, 1046 North Rengstorff Ave., Mountain View, CA 94043 (phone: 415-964-1353).

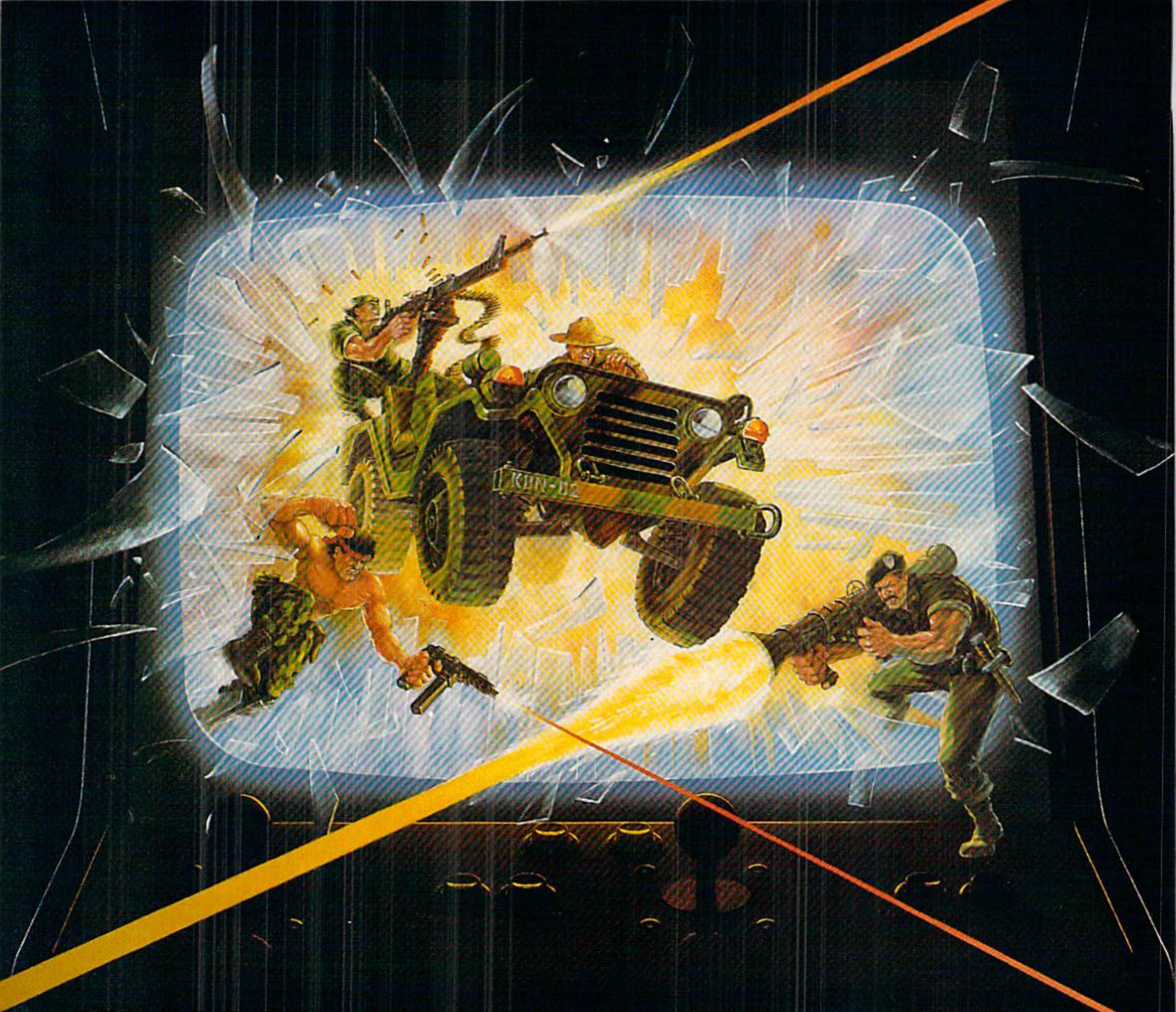
—Arnie Katz

Circle #177 on Reader Service Card

ALIEN DESTRUCTION SET
Scorpion
Commodore 64
Disk; $29.95

Despite first impressions, *Alien Destruction Set* is *not* a construction kit. It is a collection of four action and action-strategy games which share a science fiction theme. The quartet was designed by CRL, a kind of game design collective. All four feature space combat seen from an overhead perspective and enlivened by impressive music and graphics, but each has its own unique elements. As is the case with most collections of games, the four are not

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equally exciting, but the best of the *Set* is a real winner.

Thundercross is a straightforward space combat game with little in the way of innovation to recommend it. The Thundercross is a massive, lumbering craft that seems to function as an asteroid-sweeper in this horizontally scrolling contest. This sweeper can fire in any of eight directions at a variety of nondescript targets and has movement capability in all directions, including backwards. The Thundercross is protected by shields, which are automatically deactivated when the cannons fire.

Vengeance is far more polished and professional-looking, without being much more original than *Thundercross.* The player's ship moves up through a vertically scrolling playfield depicting a vast network of alien refineries. The graphics are extraordinarily sharp, as are the explosions and general sound effects. They combine to make this a compelling if slightly old-fashioned arcade experience.

Death or Glory is less conventional than either of the above. Instead of firing a standard front-mounted cannon, players in this multidirectional scrolling game drop bombs on a squadron of Deathstar-size alien destroyers. Pressing the action button while pushing forward on the joystick unleashes cataclysmic bombs capable of ripping entire sections from the hulls of any enemy ship unfortunate enough to pass below.

Jon Law's graphics on *Death or Glory* are very nice, but his stars don't move. This undermines any illusion of movement unless an alien ship is onscreen. Also, the panels blow off the hulls in neat, square sections which neither makes sense nor enhances the game's sense of realism. Even so, *Death or Glory* is an entertaining and somewhat offbeat diversion.

The jewel in the Crackerjack box, however, is unquestionably *Discovery.* At first it appears to be a simple multidirectional scrolling shootout, but it soon reveals unexpected depth. While the player's ship must deal with a horde of gnatlike alien fighters, the priority mission is to complete an all-important circuit board by winning a series of mini-games.

These mini-contests are accessed by positioning the player's ship over the entrance hatch of each of the alien space stations. The player is then transported into one of a series of action, strategy, and action-strategy contests.

The mini-games use pattern-recognition and other classic brain twister elements to create kinetic puzzles with occasional arcade flourishes. For example, one of the action games is a sideways variant of *Centipede.* Some of these puzzles are real stumpers and will take several attempts to solve, but each is worth the effort.

Alien Destruction Set is a worthwhile collection from a group of talented up-and-coming game creators. The range within this quartet of entertainments is considerable, and should prove satisfying to most fans of action-oriented science fiction games.

Scorpion, 19 Harbor Dr., Lake Hopatcong, NJ 07849 (phone: 201-663-0202). *—Bill Kunkel*

Circle #172 on Reader Service Card

STOCKER
Capcom
Commodore 64
Disk; $29.95

Okay, nostalgia lovers, here's a blast from the past: a stock car racing game with an *overhead* perspective!

With the exception of auto *combat* games, like *Spy Hunter* (Bally/Midway) and *Autoduel* (Origin), the overhead view virtually disappeared from the auto simulation scene for several good reasons. Unfortunately, *Stocker,* a stock car racing game from Capcom, illustrates all of them.

The most obvious reason for the scarcity of bird's-eye-view driving/racing games is that users are now spoiled. First-person perspectives (behind-the-wheel) and pseudo first-person (the car itself appears onscreen in the foreground) found in games like *Pole Position* (Atari), *Speed Buggy* (Data East), and *Test Drive* (Accolade) are simply more exciting.

Players clearly prefer to see the road from a driver's viewpoint because it is realistic. Driving is not an exotic experience, like piloting a spaceship; people ride in cars every day of their lives. Yet *Stocker* is presented from a point of view that only a pigeon could relate to. People don't watch auto races from blimps or hot air balloons, so they're not likely to resonate to *Stocker's* high-altitude viewpoint which displays the vehicles, buildings, and topography as faraway, insect-sized icons. Though these onscreen objects are rendered in precise detail, the vehicles become indistinguishable when viewed as if from a low-flying plane.

Worse still, the roadway doesn't scroll. Instead, the player's car reappears on a new map-section after driving off the edge of a previous screen. This is extremely disorienting, since the player must scan each new screen to locate the car's position and reorient the steering.

This disorientation is a keystone of overhead driving games. It is almost impossible to keep track of where you've been and where you're headed since there are no street signs or other markings. But then, the user is likely to have enough trouble just staying on the road.

In first-person driving games, all directions are true. Pushing the joystick left turns the car left. If a game takes the driver *outside* his vehicle, however, steering becomes compass-based. Instead of being focused around the user and his vehicle, reality is linked only to the compass headings. Pushing the joystick up (north) will always cause the car to head north, but depending upon the direction the vehicle is going in, that same command could result in the car making a turn in any of three directions.

If the car is traveling north to south and the player moves the joystick to the left (east), the car will head east by making a *right* turn. If the car is heading north and the player makes the same joystick command, the car will head east by making a *left* turn. If the car is heading east, however, the east command will invoke an abrupt U-turn.

The playfield for *Stocker* consists of the screen-sized overview, a score counter, high score, and speedometer. Other motorists include truckers, bikers, and even the Highway Patrol, who intercept speeders and cause them to lose time.

Stocker is a quaint game, almost like an antique that's been painfully restored using state-of-the-art techniques. The tiny graphics are remarkably clean-cut, with each vehicle pictured in minute detail. The race itself is accompanied

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by short musical phrases (including the old "See the USA in your Chevrolet!" jingle) that should evoke memories from users.

The problem with *Stocker* is like the problem with all spiffed-up antiques: when all is said and done, it's still an old contest, albeit an attractive one.

Capcom, 1283-C Old Mountain View/Alviso Rd., Sunnyvale, CA 94089 (phone: 408-745-7081).

—Bill Kunkel

Circle #176 on Reader Service Card

LANE MASTODON VS. THE BLUBBERMAN

Infocom
Commodore 64
Disk; $12

We hear a lot about this or that being "a bold new medium." Well, surprise, surprise, InfoComics represents a legitimately new entertainment form, computerized comic books. Created by Infocom and Tom Snyder Productions, InfoComics are *not*, nor do they attempt to be, games.

Until now, software publishers have been hidebound in clinging to games as the computer's dominant entertainment medium (with some forays into art, music, and the occasional non-game simulator). Tom Snyder theorized that there are, or should be, many different forms of interactive entertainment possible on the computer. This insight resulted in InfoComics: animated stories told with a comic book sensibility that use the computer like a VCR. The user can fast-forward, rewind, advance frame-by-frame, and periodically branch off the current storyline to follow an alternative character's point of view.

One of the real plusses for this system is its simplicity. Each InfoComic comes with a warranty, a brief explanation of the system's "branching" technique, and a list of 10 keyboard commands. This includes a Bookmark, Restart, and three running speeds. Those are the only instructions that any user requires.

The InfoComics interface is one of the most brilliant innovations in entertainment software history. The screen is set up to look like an open page of a book or magazine. On the page are two windows, the larger one filling about three-fourths of the screen. This display area represents the comic book panel, one of the series of frames in which the graphic story is told. All visuals, dialogue, and thought balloons are contained within this window. Captions are broken out into the smaller window at the bottom of the page in deference to the long-standing traditions of illustrated adventure games.

There are some very good and some very bad things about *Lane Mastodon Vs. The Blubberman*. The action is told in a form that owes much more to the cinema than the graphic story. The drawings are minimalist but very stylized. They're extremely well done with a limited but effective use of color. The numerous animated sequences utilize all the trendiest camera angles from films and TV: pans, tracking shots, fades, and transitions that have never been seen on a computer monitor. These are remarkably effective.

Unfortunately, *Lane Mastodon* reads more like a demo of the InfoComics system than an actual story that anyone might care about on its own. The story purports to be a cornball spoof of 1930s soap operas but really hasn't a clue about science fiction, before or after the 30s, and no notion at all of how comics work. Worse, the author(s) seem to have no affection for the material they're creating. They treat it with a condescending scorn that should burn in the guts of comic and SF fans like a bad burrito.

The plot involves the alien Blubbermen and their plan to take over the Earth of 2029 by turning an enlarging ray on small animals and insects. These oversized kitties and cockroaches will presumably overwhelm Earth's defenses and the Blubbermen will waddle in and pick up the pieces.

There is no reason to waste any of our time picking holes in this cheesecloth of a plot. I must ask, however, if only rhetorically, why enlarge *tiny* critters? Wouldn't it make more sense to make behemoths of creatures who are *already* big? Somehow the idea of a 300 foot rhino or a whale the size of two football fields is more intimidating than a 50 foot earthworm. That aside, the whole story, without recourse to alternate plotlines, runs in less than 10 minutes.

The story is loaded with sophomoric inanities that the writers must have felt would really have those simple-minded comic book fans rolling in the aisles. "Don't pluck your chickens before they hatch!" advises a character in one of the story's more side-splitting moments, and the designers might have listened to their own advice. *Lane Mastodon* also periodically cuts away to a Blubberman and a Thin Man (a slim race that's already been squashed by the avatars of alien avoirdupois). The pair perform a Siskel & Ebert routine, complete with the familiar theme music from "At the Movies," and remark on the plot's more inane elements.

The ironic thing about *Lane Mastodon* is how much it reads like a computer adventure without the interaction. During the story's climax, Lane reaches the pivotal enlarging ray, producing an animated sequence about how he has to turn it off. We then see a gigantic switch with ON/OFF buttons and Lane slowly pushes the OFF switch. In the moment's hesitation before Lane acts, gamers everywhere will be frantically scanning the keyboard for the "Turn ray off" command.

The InfoComics format could be the biggest software success in years. But first the creators of this wonderful tale-telling system must work to discover the kind of stories InfoComics can do best and the creators capable of writing them.

Infocom, 125 Cambridge Dr., Cambridge, MA 02140 (phone: 617-492-6000). *Bill Kunkel*

ACTION REPLAY IV

Datel Computers
Commodore 64
Cartridge: $59.99

I'm always put off by advertising that uses superlatives such as "ultimate." But Datel has some justification for claiming as they do that their Action Replay is "the ultimate backup cartridge." The main use of the product is to create backups of protected software. We will cover that function last, and first describe its other features.

Overview

The cartridge fits in the 64's expansion slot. It has two pushbuttons, Reset and Freeze. When plugged into a C-128, the computer powers up in C-64

Continued on page 54

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1040 C003 4C 33 C0          JMP TWO
1050 C006 A9 00    ONE      LDA #0          CLEAR TABLE THAT
1060 C008 8D 36 03          STA TAB         CONTROLS WHEN ALL
1070 C00B 8D 37 03          STA TAB+1       FOUR SCREEN
1080 C00E 8D 38 03          STA TAB+2       SECTIONS HAVE BEEN
1090 C011 8D 39 03          STA TAB+3       PROCESSED
1100 C014 A9 EA             LDA #234        DISABLE STOP/RESTORE
1110 C016 8D 28 03          STA 808
1120 C019 A9 F9    RANDOM   LDA #249
1130 C01B 8D 0E D4          STA $D40E
1140 C01E A9 EE             LDA #238
1150 C020 8D 0F D4          STA $D40F       USE SID VOICE 3 TO
1160 C023 A9 00             LDA #0          GENERATE RANDOM
1170 C025 8D 18 D4          STA $D418       NUMBERS
1180 C028 A9 81             LDA #129
1190 C02A 8D 12 D4          STA $D412
1200 C02D A9 A0             LDA #160        ALTERNATE TEXT
1210 C02F 8D 88 02          STA 648         SCREEN @ $A000
1220 C032 60                RTS
1225
1230 C033 A2 00    TWO      LDX #0
1240 C035 A9 04             LDA #4
1250 C037 85 FC             STA $FC         PREPARES ZERO PAGE
1260 C039 86 FD             STX $FD         POINTERS TO REAL
1270 C03B 86 FB             STX $FB         AND ALTERNATE
1280 C03D A9 A0             LDA #$A0        SCREENS
1290 C03F 85 FE             STA $FE
1300 C041 A5 01             LDA 1           SWITCH OUT BASIC ROM
1310 C043 29 FE             AND #254
1320 C045 85 01             STA 1
1325
1330 C047 AD 1B D4 NEWONE   LDA $D41B
1340 C04A A8                TAY
1350 C04B B1 FB             LDA ($FB),Y
1360 C04D D1 FD             CMP ($FD),Y
1370 C04F F0 36             BEQ OTHER
1380 C051 B1 FD    SI       LDA ($FD),Y
1390 C053 91 FB             STA ($FB),Y
1400 C055 A2 00    HERE2    LDX #0
1410 C057 BD 36 03 CHECK    LDA TAB,X       GET RANDOM NUMBER
1420 C05A F0 07             BEQ HERE        USE AS INDEX TO
1430 C05C E8                INX             TRANSFER REAL
1440 C05D E0 04             CPX #4          SCREEN ALTERNATE
1450 C05F 90 F6             BCC CHECK
1460 C061 B0 55             BCS DONE
1470 C063 E6 FE    HERE     INC $FE
1480 C065 E6 FC             INC $FC
1490 C067 A5 FC             LDA $FC
1500 C069 C9 08             CMP #8
1510 C06B 90 DA             BCC NEWONE
```

SCREEN

Fade In / Fade
Your

By Peter

Through the years I have seen several fancy ways of displaying or erasing text screens on the Commodore 64. But my favorite effect is achieved by this short and easy to use machine language utility which uses a technique usually seen in hi-res screens. I call it "materializing" a screen or "dematerializing" it. Visually, the screen fades in or out of view, or fades away as a new screen fades in. As text screens are used much more than hi-res screens, I wrote the *Screen Pocus* utility for text screens on the C-64. You will be able to "fade in" or "fade out" text screens at the speed you wish. It's great for flashy screens, or to make new screens appear in multilevel games, or for menus, or wherever you need it. The utility is short, relocatable, and extremely easy to use!

TYPING IT IN

Screen Pocus is an all-ML utility, presented as a BASIC loader that also allows relocation of the routine. Type in the BASIC program and save it. Then type RUN. The ML routine will be POKEd to memory. It is currently loaded at address 49152, but change the value of SA to whatever start address you wish.

USING SCREEN POCUS

The utility has two entry points: one to create the screen which will fade into view, and the other to actually make the screen visible. Let's see how to use them.

SYS SA, where SA is the address at which you located the utility, will start the random number generator, clear some values, and place you at an alternate text screen (placed under

POCUS 64

Out Effects on Commodore

M.L. Lottrup

BASIC ROM at $A000-$A3FF). Whatever you print after this call will not be visible on the standard screen, but will be ready to materialize later. Make sure that this alternate screen you print does not cause a screen-scroll, or the resulting "materializing" screen will be garbage.

SYS SA+3 will start the materializing process, bringing the screen you printed earlier into view, shifting out whatever was currently in display.

Address 2 controls the shift speed, where 1 is the fastest speed and 255 (or 0) is the slowest. POKE the desired speed in memory location 2. A value of 70 is recommended for most uses.

A couple of things to take care of: as pressing RUN STOP or RUN STOP/RESTORE while creating the alternate screen (between the two SYS calls) would leave you in an awkward position (you won't be able to see what you type), the routine disables these keys until the screen has been materialized. This routine should not be used together with sounds or sprites. Also, try using the same colors, as color memory is the same for all screens (test this for best results and see the demo program included).

The routine uses the following addresses to operate:

$C000 - $C0C8 (when loaded at 49152)
2, 251-254, 820-822
$A000 - $A400 (located under BASIC ROM).

The short demo program I have included shows the power of this utility. It is written in BASIC, so just type it in and save it. The demo assumes the *Screen Pocus* utility is loaded in memory at $C000 (49152). □

SEE PROGRAM LISTINGS ON PAGE 73

The BASIC loader and demo for *Screen Pocus 64* are found on page 73. Source code is listed here for informational purposes.

```
C06D A9 04                 LDA #4
C06F 85 FC                 STA $FC
C071 A9 A0                 LDA #$A0
C073 85 FE                 STA $FE

C075 A5 02                 LDA 2
C077 8D 34 03              STA TEMP
C07A A0 19        WA2      LDY #25
C07C 88           WA1      DEY          DELAY
C07D D0 FD                 BNE WA1
C07F CE 34 03              DEC TEMP
C082 D0 F6                 BNE WA2
C084 18                    CLC
C085 90 C0                 BCC NEWONE
C087 8C 35 03     OTHER    STY GUARDA
C08A AD 1B D4              LDA $D41B
C08D C9 80                 CMP #128
C08F 90 05                 BCC DECR
C091 A9 C8                 LDA #$C8
C093 18                    CLC
C094 90 02                 BCC NEST
C096 A9 88        DECR     LDA #$88
C098 8D A4 C0     NEST     STA POSIT
C09B AC 35 03              LDY GUARDA
C09E B1 FB        WAIT     LDA ($FB),Y   LOOP USED WHEN SCREEN POSITION HAS BEEN COPIED.
C0A0 D1 FD                 CMP ($FD),Y
C0A2 D0 AD                 BNE SI
C0A4 C8           POSIT    INY
C0A5 CC 35 03              CPY GUARDA    MOVES LEFT/RIGHT AT RANDOM, UNTIL AVAILABLE POSITION IS FOUND
C0A8 D0 F4                 BNE WAIT
C0AA A5 FC                 LDA $FC
C0AC 38                    SEC
C0AD E9 04                 SBC #4
C0AF A8                    TAY
C0B0 A9 01                 LDA #1
C0B2 99 36 03              STA TAB,Y
C0B5 18                    CLC
C0B6 90 9D                 BCC HERE2

C0B8 A9 04        DONE     LDA #4        RESTORE DEFAULT SCREEN
C0BA 8D 88 02              STA 648
C0BD A9 ED                 LDA #237      ENABLE STOP-RESTORE
C0BF 8D 28 03              STA 808
C0C2 A5 01                 LDA 1         RESTORE ROM
C0C4 09 01                 ORA #1
C0C6 85 01                 STA 1
C0C8 60                    RTS           BACK TO BASIC
C0C9                       TEMP = 820
C0C9                       GUARDA = 821
C0C9                       TAB = 822
```

Continued from page 50
mode. When powered up or reset, a menu is presented, and the function keys can be used to select "Configure Memory," "Normal Reset," "Utilities," and "Install Fastload." "Configure" is (sometimes) used preparatory to the backup process. The documentation does not explain this configuration process. Normal reset takes you to the familiar light blue on dark blue C-64 opening screen. The Utilities selection presents another menu with a number of very useful disk operations, including file and whole disk copy. These are for use with unprotected disks.

When Fastload is installed, a number of enhancements are made to the C-64's operation. With *Action Replay's* "standard" disk turbo, loads and saves occur at 6-7 times normal speed. Without the cartridge, turbo-saved programs will load slightly faster than normal. The Warp*25 Turbo, however, will load a previously warp-saved program in 6-7 seconds. These warped programs can only be loaded by Fastload—the cartridge must be plugged in—or by a special loader that the utilities menu allows you to save to the same disk.

A DOS wedge is enabled, permitting shorthand disk commands similar to those of DOS 5.1. Some useful direct mode only BASIC commands are provided, including OLD, DELETE, MERGE, APPEND, and AUTO. Notably absent is RENUMBER, but you can't have everything. A very powerful machine language monitor is also available. In addition to the usual MLM features, this one provides Compare, Transfer, and Number conversion. It can bank switch, accessing the C-64's hidden memory, and, for the adventurous hacker, it can perform its operations on the disk drive! A nice touch is the ability to scroll up and down through a disassembly.

Two negative points: The DOS wedge doesn't seem to allow pattern matching (*) on a directory, and always lists all names on a disk. When Fastload is enabled, direct mode always sets the character color to white, which causes the cursor to disappear if the screen is white, as it is on a SX-64.

All these features—Fastload, DOS wedge, BASIC enhancements, and the MLM—use no C-64 main memory. Like other "transparent" cartridges, however, Action Replay occupies both I/O blocks 1 and 2, and no other boards can be plugged into the expansion port. The cartridge has the intelligence to lock up the computer if an attempt is made to disassemble certain addresses in I/O 1 or 2.

One feature not tested for this review was the Tape Turbo. According to the instructions, tape I/O is speeded up 5-6 times using Fastload. Tape backups, on the other hand, load independent of the cartridge.

Backups

Unlike utilities that attempt to defeat the protection on a disk, and thus copy it, *Action Replay* is designed to "freeze" a program once it's in memory and then save a functioning, unprotected copy of the computer's memory. As always, some copy protected programs will be more resistant to copying than others. Extensive experimentation may be necessary to copy a particular program and confirm that the copy operates correctly. At this point we emphasize that a backup should be just that: a copy of a program owned and used by the legal purchaser of said program, as insurance against the loss or damage of the original.

In most cases, the copy process will be as follows: Choose normal reset from the *Action Replay* opening menu. Load the program you want to back up in the usual way. When the program is running, press the cartridge's Freeze button. A menu is presented with "backup" as one of the choices. If this is selected, the screen border changes color for a few seconds, indicating that the program is being compacted and otherwise prepared for saving. When this process is complete, another menu is displayed with various save options. A normal or standard save will save the computer's memory in a form that can be loaded (slowly), without the cartridge being present. Turbo save puts the program into *Action Replay's* fastload format, and Warp*25 is a superfast option. Fastload-formatted saves can be loaded without the cartridge, at slightly faster than normal speed. Warp saved programs can only be loaded by the cartridge or by the special loader mentioned earlier. So not only do you get to backup your vulnerable originals, but you get to speed up the loading time as well.

Some variation on this scenario may be required, depending on how well protected the program is. *Action Replay* provides enough flexibility to back up virtually any copy protected program. For an additional charge ($14.99), a "Parameter Support" disk is available for use on the more resistant programs.

A number of operations can be performed on a "frozen" program. Screens can be saved to tape or disk in *Koala, Blazing Paddles,* or several other formats. Hi-res and multicolor screens can be dumped to a printer. Text within a game can be altered or sprite collisions disabled, making the player invincible. (Where's the challenge in that?) Sprites can be saved from one game, then loaded into another. Since the MLM is available, the program can be disassembled and modified. Because of copyright laws, any modified versions of commercial software must be for the amusement and entertainment of the owner of the software. They can be neither sold nor given away. To do so is piracy.

Finally

Backing up protected software with *Action Replay* is relatively trouble free, less so than with disk-based nibblers and parameter copiers. With all its extras—BASIC enhancement, Fastload, etc.—*Action Replay* is well worth its $59.99 price tag.

Datel Computers, 3430 E. Tropicana Avenue, Unit #67, Las Vegas, NV 89121 (phone: 702-454-7700).

—Richard Curcio

Circle #223 on Reader Service Card

SCREENSAVER64

For the C-64

By Richard Curcio

A routine to save and recall the C-64 text screen can be put to a number of uses. Help screens, low-res animation, and pseudo-windows are a few of the possibilities. *ScreenSaver64* will allow you to achieve these effects.

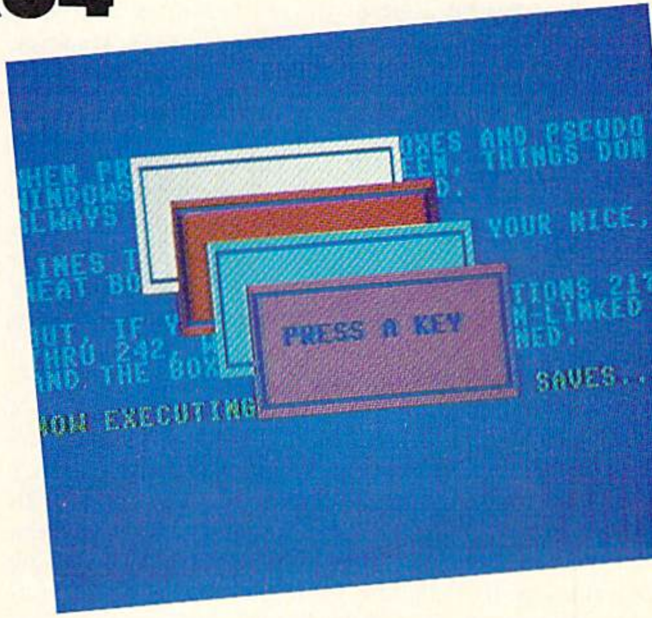


PHOTO: MICHAEL R. DAVILA

LOADER AND USAGE

The BASIC loader for *ScreenSaver* POKEs the machine language into RAM at 51200. The ML can be relocated by changing the variable SS in line 110. When the loader is RUN it reports the range of memory occupied and displays several SYS locations. These in effect are a "mini" jump table to perform the following actions:

```
SYS SS save screen information
SYS SS +3 recall screen information
SYS SS +6 clear links
```

The simplest operations are Save, which obviously saves the current text screen and color memory, and Recall, which recalls a previously saved screen to the current screen. In addition to the screen characters and colors, the routine stores the current cursor position, the current color, the reverse flag, and the screen line link table. This last item consists of 25 bytes at zero page locations 217-242 ($D9-$F2) that hold the high bytes of pointers to the start of each screen

line. (Ignoring bit 7, these bytes aren't absolute addresses, but are instead off-sets into the 16K video bank. However, when the screen is in the default VIC bank 0, these bytes appear to be the absolute addresses.) Bit 7 of each byte indicates whether that line is linked to the line above it. If bit 7 of a byte is clear (0), the line is said to be linked. This is what happens when PRINTing "wraps" from the right edge of the screen to the left edge of the line below. *ScreenSaver* includes an operation to un-link the screen lines by setting bit 7 of each link byte to "1". This is important when message boxes and such are to be printed over existing text.

ScreenSaver stores the screen information in the C-64's "hidden" memory. Location SS +9 holds the high byte of the start of storage. As written, this byte is 208 ($D0), corresponding to 53248 divided by 256, the start of the very well hidden RAM under I/O and character ROM at $D000-$DFFF. Since this area is 4K of RAM, it has enough room for two complete text screens with color memory and link information. By POKEing new values into SS +9, the routine can be made to store many more screens. Each new high byte should be on a 2K boundary, for example 208, 216, 224, 232, etc. Storage doesn't have to be in hidden memory. Care should be taken to ensure that a storage area doesn't conflict with another program's use of that location. *ScreenSaver* uses the contents of location 648 to determine where the active text screen is located, and can access a screen moved from its default location. Recalled screens, however, must be returned to the location they came from. Also, the routine cannot access an active screen in hidden RAM. Because the routine is switching the ROMs and I/O in and out, it should not be utilized with a program that uses Non Maskable Interrupts, such as modem and RS-232 programs.

To use this utility for "help" screens, print your information screen, then POKE SS +9, HS where HS is the high byte of the address to store the help screen, then SYS SS. When the need arises in your program to display the help screen, POKE SS +9, CS where CS is the high byte of the address to store the current screen, and save it with SYS SS. Then POKE SS +9, HS and recall the help screen with SYS SS +3. When the help screen is no longer needed, POKE SS +9, CS and recall the original screen with SYS SS +3 and the help screen disappears.



"But we have a special sale, Mr. Eastwood...are you *sure* you don't need an anti-glare screen?"

MESSAGE BOXES AND WINDOWS

Implementing windows like the C-128's on the C-64 is a major undertaking, requiring many pages of machine language. *ScreenSaver,* however, can perform a reasonable impersonation of such a facility. To display a message box, or a "pop-up menu" overlaying the existing text, the screen links must first be cleared. The operating system simply will not let you print over linked lines in the way that you intend. A neatly formatted box comes out very un-neat when linked lines are present.

The demo program contains a subroutine to print boxes based on C. Pickrell's program in the April 1988 *Tips Ahoy!* The program has been slightly enhanced by the use of a *Screen Wizardry* trick (February 1988) to position the cursor. An option to print the box in reverse is also included. When the routine is called, W is the width of the box, H is its height, D is down from the top of the screen, and R is columns right. The variable RV$ is the reverse flag and is either reverse on (CTRL-9) or reverse off (CTRL-0).

To simulate a window, first SYS SS to save the screen and links, then SYS SS +6 to clear the links. GOSUB to the box routine and print your message, menu, or whatever. To make this pseudo-window disappear, SYS SS +3 and the screen is restored to what it was before the box was displayed. To display a box, with no intention of recalling the text that it overwrites, first SYS SS +6 to un-link the screen lines, then call the box subroutine. Your display will be as neat as you envisioned it.

When using box routines like this, it's up to the user to make sure that the text within the box doesn't extend beyond the borders. LEN, POS, and other string functions will be useful in this regard. See *BASIC Obscurities,* April 1988 *Rupert Report.*

ROLL YOUR OWN

If you have some other memory mover that you prefer to use, it can duplicate *ScreenSaver's* operation by storing the screen and color memory in some location, and including a call that stashes the 25 link bytes somewhere. All that remains is to clear the link table before PRINTing any boxes. This can be done in BASIC with the statement

```
FOR I = 0 to 24: POKE 217 +I, PEEK (217 +I) OR 128: NEXT
```

This takes 25 jiffies—about half a second. If this is too slow for you, the ML to accomplish the same thing is quite short. POKE the following data into any free 12 bytes of memory:

```
DATA 162, 181, 217, 9, 128, 217, 202, 16, 247, 96
```

SEE PROGRAM LISTING ON PAGE 69

TIPS AHOY!

Continued from page 26

One might, for example, build an array of line numbers, then use the format GOTO.L(J) as a powerful version of ON-GOTO with destination lines limited only by available memory. When writing a text-based game, this could be a huge time-saver. By using a string array for the words, such as WD$(n), and a parallel numeric array for line numbers, e.g., WD(n), locating the correct string also gives the correct line. Then just GOTO.WD(n).

Although the default storage area for the ML is 4864, it's fully relocatable and can be put anywhere there are 44 free bytes. Once activated, only a cold reset will stop it. Fair warning: RENUMBER has no effect on this command, even if a valid line number follows it. Lastly, although it's unlikely to happen, if you get an UNDEFINED STATEMENT error, check the math. Some functions, such as exponents, give unexpected results. —Bob Renaud
Washington, MA

```
•1 INPUT"ML LOAD ADDRESS 4864[6"[LEFT]"]"
;X
•2 DATA A5,3D,D0,02,C6,3E,C6,3D,20,C9,03
•3 DATA C9,89,F0,06,C9,8D,F0,02,D0,13,20
•4 DATA 80,03,C9,2E,D0,0C,20,80,03,20,96
•5 DATA AF,20,0C,AF,4C,FB,59,6C,12,03,00
•6 FORJ=XTOX+43:READK$:K=DEC(K$):T=T+K:PO
KEJ,K:NEXT
•7 IFT<>4500THENPRINT"[RVSON]DATA ERROR!"
:END
•8 POKE786,PEEK(768):POKE787,PEEK(769)
•9 POKE768,XAND255:POKE769,X/256:END
```

NO DIM WAITS

The vast expanse of variable memory available to C-128 users allows the creation of some truly prodigious data-arrays. When saving the array to disk, it's usually done as a sequential file, value by value. In one of my programs, I used the array DT(53,40,2), which if stored sequentially and starting at DT(0,0,0) would require saving 6642 values, permitting a nap while it's running. Being impatient, I wanted a faster way. Bless BASIC V7.0, there IS one.

First, DIMension all variables at the beginning of the program, and make the array variable the last one. Then, when it's time to save it, use a line similar to this one from my program:

```
BSAVE"DT",B1,P(POINTER(DT(0,0,0)))TO P(P
EEK(51)+256*PEEK(52))
```

This saves the entire array as a binary file (51,52 form the zero-page pointer for the last address for array variables). To load the file, use this format:

```
BLOAD"DT",B1,P(POINTER(DT(0,0,0)))
```

In each case, B1 specifies Bank 1, the variable memory area. Fair warning: *don't omit it.* If multiple arrays are in use, start at the POINTER to the first array, and it will save them all. Also note that if the zero values in the array aren't used, start the BSAVE and BLOAD using 1's rather than 0's (ex: DT(1,1,1)) which saves times and cuts the file length considerably. I use them, so I can't skip them, but starting at DT(1,1,1) would reduce the file to 4240 values. If possible, using integer arrays would make it far smaller still.

As an indication of reduced waiting time, using a 1571 my 131 block file SAVEs in one minute, 12 seconds (including SCRATCH time for the old file) and loads in 8 seconds. If you've had the displeasure of waiting and twiddling thumbs while your sequential file saves or loads, give this technique a shot. The difference is amazing.

—Bob Renaud
Washington, MA

SIMPLE SMOOTH SCROLL

This neat program lets you create a smooth sliding message like those used on Wall Street. Simply type in the program, run it, and type in your message when the word MESSAGE appears. SYS 52224 ($CC00) starts the scroll. For greater effects you can use your own character sets. Using SHIFTed characters creates reversed characters. To rewrite the message just run line 500. —Marcus Linkert
Glendale, NY

```
•10 REM   -SYS52224  TO START-
•20 REM  -SIMPLE SMOOTH SCROLL-
•30 REM  -BY MARCUS LINKERT-
•40 H$="0123456789ABCDEF"
•50 HD$=""
•60 V=52223
•70 READ HD$:V=V+1:PRINTV,HD$
•80 IF V=52435 THEN GOTO 500
•90 IF LEN(HD$)=0THEN PRINT"ERROR":END
•100 IFLEN(HD$)<>2THEN PRINT"ERROR":END
•110 H=0
•120 FORI=1TO16
•130 IFLEFT$(HD$,1)=MID$(H$,I,1)THENH=I:I
=16
•140 NEXT I
•150 IF H=0 THEN POKE V,0:GOTO 70
•160 H=H-1
•170 L=0
•180 FORI=1TO16
•190 IF RIGHT$(HD$,1)=MID$(H$,I,1)THENL=I
:I=16
•200 NEXTI
•210 IF L=0 THEN POKEV,0:GOTO 70
•220 L=L-1
•230 D=H*16+L
•240 POKEV,D
•250 GOTO 70
•260 DATA 78,A9,3E,8D,14,03,A9,CC,8D
•270 DATA 15,03,AD,11,D0,29,7F,8D,11
•280 DATA D0,A9,90,8D,12,D0,A9,81,8D
•290 DATA 19,D0,8D,1A,D0,AD,0E,DC,29
•300 DATA FE,8D,0E,DC,AD,16,D0,29,F7
•310 DATA 09,07,8D,16,D0,A9,E0,85,FB
```

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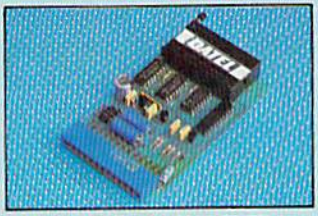
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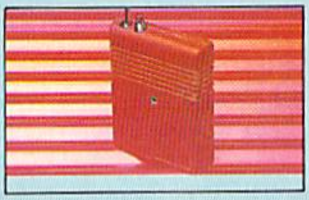
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- Burst Nibbler is the most powerful Nibbler around – but even the best can be better.
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- Regularly updated to include any new titles.
- This disk is by no means a necessity – the standard Burst Nibbler will copy 98% of software as is – if you want to go to the limits, this is the product for you!

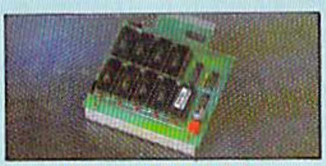
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- NOW YOU CAN HAVE A 32K CARTRIDGE THAT YOU PROGRAM LIKE RAM THEN ACTS LIKE ROM!
- 32K pseudo ROM – battery backed to last up to 2 years (lithium battery).
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DATEL COMPUTERS
3430 E. TROPICANA AVENUE, UNIT #67, LAS VEGAS, NV 89121

```
•320 DATA A9,CC,85,FC,C6,FB,58,60,AD
•330 DATA 19,D0,29,01,F0,23,C6,FD,10
•340 DATA 04,A9,07,85,FD,C6,FD,AD,16
•350 DATA D0,29,F0,05,FD,8D,16,D0,A9
•360 DATA 79,8D,14,03,A9,CC,8D,15,03
•370 DATA A9,A4,8D,12,D0,A9,81,8D,19
•380 DATA D0,8D,1A,D0,AD,0D,DC,68,A8
•390 DATA 68,AA,68,40,AD,19,D0,29,01
•400 DATA F0,48,AD,16,D0,09,07,8D,16
•410 DATA D0,A5,FD,D0,2D,A8,C8,B9,08
•420 DATA 06,88,99,08,06,4C,9A,CC,EA
•430 DATA EA,C8,C0,28,D0,EE,A0,00,E6
•440 DATA FB,D0,02,E6,FC,B1,FB,D0,0B
•450 DATA A9,E0,85,FB,A9,CC,85,FC,4C
•460 DATA A7,CC,8D,2F,06,A9,3E,8D,14
•470 DATA 03,A9,CC,8D,15,03,A9,90,8D
•480 DATA 12,D0,A9,81,8D,19,D0,8D,1A
•490 DATA D0,4C,31,EA,00
•500 REM -MESSAGE WRITER-
•510 A=52448:POKE204,0:PRINT"MESSAGE:"
•520 GET A$:IF A$="" THEN 520
•530 IF A$=CHR$(13) THEN POKEA,0:END
•540 IF ASC(A$)<65 THEN PRINTA$;:POKEA,AS
 C(A$):A=A+1:GOTO 520
•550 PRINTA$;:POKEA,ASC(A$)-64:A=A+1:GOTO
 520
```

C-128 EASY MERGE

While looking at a memory map of the C-128, I discovered a method of merging two programs without using a bunch of PEEKs and POKEs.

First you must create a sequential file of the program you want to merge with the main program. This is done with the following commands:

```
OPEN 8,8,8,"filename.ASC,S,W":CMD8:LIST:
PRINT#8:CLOSE8
```

Then load the main program and type:

```
OPEN 8,8,8,"filename.ASC":BANK15:SYS6547
8,0,8:CLOSE8
```

The SYS is a standard Commodore kernal jump which sets a specified channel for input.

You may get a Syntax error but ignore it. This is a true merge (lines with same numbers will be replaced).

—Steve Stutts
Loretto, TN

QUOTE SWITCHER

Quote mode, the strange transformation that comes over your Commodore 64 when you press SHIFT-2, can be very useful for entering certain cursor positioning and control commands that would otherwise only be available through tedious CHR$ codes. However, it can become extremely frustrating, especially when editing PRINT statements. To avoid getting high blood pressure from using quote mode, simply run this short BASIC program. It POKEs a short machine language program into memory locations 49152-49189 and enables it. Now, to enter quote mode, just press the f1 key. To get out of quote mode, press f3. If at some point during your programming, you press RUN STOP/RESTORE, you will have to enter SYS 49152 in order to reenable *Quote Switcher.*

—Jeremy Baer
Mulino, OR

```
•5 T=0:SA=49152
•10 FOR C=SATOSA+37:READD:T=T+D:POKEC,D:N
 EXT
•15 IF T<>4252THENPRINT"[CLEAR][BLACK]ERR
 OR IN DATA STATEMENTS!":STOP
•20 SYS 49152
•25 PRINT"[CLEAR][CYAN]QUOTE SWITCHER INS
 TALLED":STOP
•49152 DATA 120,169,13,141,20,3
•49158 DATA 169,192,141,21,3,88
•49164 DATA 96,165,197,201,5,208
•49170 DATA 7,169,0,133,212,76
•49176 DATA 34,192,201,4,208,4
•49182 DATA 169,1,133,212,76,49
•49188 DATA 234,186
```

AUTO INSERT

What Commodore user hasn't typed a command over screen info without thinking, with a SYNTAX ERROR for the effort? This ML routine (for the C-128 only) all but eliminates this nuisance. After any direct-mode operation, e.g., a program edit, a line-insert leaves the cursor flashing in an empty line, and a bell dings to say that it's ready for more input.

The program asks for a load address. Any RAM area with 28 free bytes can be used. Once loaded, key F8 (or POKE250,1) activates it and key F6 (or POKE250,0) turns it off. Delete line 5 if this will interfere with needed F-key definitions.

Only a cold reset will disable it, whence a SYS call restarts it. The program will tell you what to use.

—Bob Renaud
Washington, MA

```
•1 INPUT"[CLEAR]ML ADDRESS";A:B=A+27:C=A+
 11
•2 FORJ=ATOB:READD:V=V+D:POKEJ,D:NEXT
•3 IFV<>2744THENPRINT"[DOWN][RVSON]DATA E
 RROR!":END
•4 L%=CAND255:H%=C/256:POKEA+1,L%:POKEA+6
 ,H%:SYSA
•5 KEY6,"POKE250,0"+CHR$(13):KEY8,"POKE25
 0,1"+CHR$(13)
•6 PRINT"AFTER RESET, ENTER 'SYS"A"[LEFT]
 '":END
•7 DATA 169,198,141,002,003,169,077
•8 DATA 141,003,003,096,165,250,208
•9 DATA 003,076,198,077,032,129,146
•10 DATA 027,073,007,000,076,198,077
```

PROGRAM LISTINGS

Attention new *Ahoy!* readers! You must read the following information very carefully prior to typing in programs listed in *Ahoy!* Certain Commodore characters, commands, and strings of characters and commands will appear in a special format. Follow the instructions and listings guide on this page.

On the following pages you'll find several programs that you can enter on your Commodore computer. But before doing so, read this entire page carefully.

To insure clear reproductions, *Ahoy!'s* program listings are generated on a daisy wheel printer, incapable of printing the commands and graphic characters used in Commodore programs. These are therefore represented by various codes enclosed in brackets [ ]. For example: the SHIFT CLR/HOME command is represented onscreen by a heart . The code we use in our listings is [CLEAR]. The chart below lists all such codes which you'll encounter in our listings, except for one other special case.

The other special case is the COMMODORE and SHIFT characters. On the front of most keys are two symbols. The symbol on the left is obtained by pressing that key while holding down the COMMODORE key; the symbol on the right, by pressing that key while holding down the SHIFT key. COMMODORE and SHIFT characters are represented in our listings by a lower-case "s" or "c" followed by the symbol of the key you must hit. COMMODORE J, for example, is represented by [c J], and SHIFT J by [s J].

Additionally, any character that occurs more than two times in a row will be displayed by a coded listing. For example, [3 "[LEFT]"] would be 3 CuRSoR left commands in a row, [5 "[s EP]"] would be 5 SHIFTed English Pounds, and so on. Multiple blank spaces will be noted in similar fashion: e.g., 22 spaces as [22 " "].

Sometimes you'll find a program line that's too long for the computer to accept (C-64 lines are a maximum of 80 characters, or 2 screen lines long; C-128 lines, a maximum of 160 characters, 2 or 4 screen lines in 40 or 80 columns respectively). To enter these lines, refer to the *BASIC Command Abbreviations Appendix* in your User Manual.

On the next page you'll find our *Bug Repellent* programs for the C-128 and C-64. The version for your machine will help you proofread programs after typing them. (Please note: the *Bug Repellent* line codes that follow each program line, in the whited-out area, should *not* be typed in. See instructions preceding each program.)

On the second page following you will find *Flankspeed*, our ML entry program, and instructions on its use.

Call *Ahoy!* at 212-239-6089 with any problems (if busy or no answer after three rings, call 212-239-0855).

WHEN YOU SEE	IT MEANS	YOU TYPE	YOU WILL SEE
[CLEAR]	Screen Clear	SHIFT CLR/HOME	
[HOME]	Home	CLR/HOME	
[UP]	Cursor Up	SHIFT ↑ CRSR ↓	
[DOWN]	Cursor Down	↑ CRSR ↓	
[LEFT]	Cursor Left	SHIFT ← CRSR →	
[RIGHT]	Cursor Right	← CRSR →	
[SS]	Shifted Space	SHIFT Space	
[INSERT]	Insert	SHIFT INST/DEL	
[DEL]	Delete	INST/DEL	
[RVSON]	Reverse On	CNTRL 9	
[RVSOFF]	Reverse Off	CNTRL 0	
[UPARROW]	Up Arrow	↑	↑
[BACKARROW]	Back Arrow	←	←
[PI]	PI	π	π
[EP]	English Pound	£	£

WHEN YOU SEE	IT MEANS	YOU TYPE	YOU WILL SEE
[BLACK]	Black	CNTRL 1	
[WHITE]	White	CNTRL 2	
[RED]	Red	CNTRL 3	
[CYAN]	Cyan	CNTRL 4	
[PURPLE]	Purple	CNTRL 5	
[GREEN]	Green	CNTRL 6	
[BLUE]	Blue	CNTRL 7	
[YELLOW]	Yellow	CNTRL 8	
[F1]	Function 1	F1	
[F2]	Function 2	SHIFT F1	
[F3]	Function 3	F3	
[F4]	Function 4	SHIFT F3	
[F5]	Function 5	F5	
[F6]	Function 6	SHIFT F5	
[F7]	Function 7	F7	
[F8]	Function 8	SHIFT F7	

BUG REPELLENT FOR THE 64 & 128 By BUCK CHILDRESS

Please note: the *Bug Repellent* programs listed here are for *Ahoy!* programs published from the May 1987 issue onward! For older programs, use the older version.

Type in, save, and run *Bug Repellent*. You'll be asked if you want automatic saves to take place. If so, you're prompted for the device, DISK (D) or TAPE (T). You then pick a starting file number, 0 through 99. Next, you enter a name, up to 14 characters long. At this point, *Bug Repellent* verifies your entries and gives you a chance to change them if you want. If no changes are needed, *Bug Repellent* activates itself. (Pressing RETURN without answering the prompts defaults to disk drive and begins your files with "00BACKUP".)

Type NEW and begin entering an *Ahoy!* program. As you enter program lines and press RETURN, a *Bug Repellent* code appears at the top of your screen. If it doesn't match the code in the program listing, an error exists. Correct the line and the codes will match.

If used, automatic saves take place every 15 minutes. When the RETURN key is pressed on a program line, the screen changes color to let you know that a save will begin in about three seconds. You may cancel the save by pressing the RUN STOP key. The file number increments after each save. It resets to 00 if 99 is surpassed. After saving, or cancelling, the screen returns to its original color and the timer resets for 15 minutes.

When you've finished using *Bug Repellent*, deactivate it by typing SYS 49152 [RETURN] for the Commodore 64 or SYS 4864 [RETURN] for the Commodore 128.

C-64 BUG REPELLENT

```
·10 PRINTCHR$(147)"LOADING AND CHECKING THE DATA[3"."]":J
=49152
·20 FORB=0TO11:READA:IFA<0ORA>255THEN40
·30 POKEJ+B,A:X=X+A:NEXTB:READA:IFA=XTHEN50
·40 PRINT:PRINT"ERROR IN DATA LINE:"PEEK(64)*256+PEEK(63)
:END
·50 X=0:J=J+12:IFJ<49456THEN20
·60 POKE198,0:POKE49456,0:A$="Y":B$=A$:C$="D":D$="DISK":D
=8:PRINTCHR$(147)
·70 INPUT"DO YOU WANT AUTOMATIC SAVES (Y/N)";A$:PRINT:IFA
$="Y"THEN90
·80 PRINT"NO AUTOMATIC SAVES[3"."]":GOTO150
·90 POKE49456,1:INPUT"DISK OR TAPE (D/T)";C$:IFC$<>"D"THE
ND=1:D$="TAPE"
·100 POKE49457,D:D$=D$+" DRIVE":PRINT:INPUT"FILE NUMBER (
0-99)";N
·110 N$=RIGHT$(STR$(N),2):IFN<10THENN$=CHR$(48)+CHR$(N+48
)
·120 F$="BACKUP":PRINT:INPUT"FILENAME";F$:F$=N$+LEFT$(F$,
14):L=LEN(F$)
·130 POKE49458,L:FORJ=1TOL:POKE49458+J,ASC(MID$(F$,J,1)):
NEXTJ:PRINT
·140 PRINT"SAVING DEVICE ** "D$:PRINT"STARTING WITH ** "F
$
·150 PRINT:INPUT"IS THIS CORRECT (Y/N)";B$:IFB$<>"Y"THEN6
0
·160 POKE770,131:POKE771,164:SYS49152:END
·170 DATA169,79,32,210,255,162,38,160,192,204,3,3,1507
·180 DATA208,10,162,131,160,164,169,70,32,210,255,44,1615
·190 DATA169,78,32,210,255,142,2,3,140,3,3,76,1113
·200 DATA36,193,32,96,165,134,122,132,123,32,115,0,1180
·210 DATA170,240,243,162,255,134,58,144,3,76,150,164,1799
·220 DATA32,107,169,32,121,165,173,0,2,240,5,169,1215
·230 DATA79,141,2,3,76,162,164,169,0,133,2,133,1064
·240 DATA251,133,252,133,254,24,101,20,69,254,230,254,197
5
·250 DATA24,101,21,69,254,170,230,254,164,252,185,0,1724
·260 DATA2,133,253,201,34,208,6,165,2,73,255,133,1465
·270 DATA2,201,32,208,4,165,2,240,8,138,24,101,1125
·280 DATA253,69,254,170,44,198,254,230,252,164,253,208,23
49
·290 DATA213,138,41,240,74,74,74,74,24,105,129,141,1327
·300 DATA44,193,138,41,15,24,105,129,141,45,193,162,1230
·310 DATA0,189,43,193,240,12,157,0,4,173,134,2,1147
·320 DATA157,0,216,232,208,239,169,38,141,2,3,173,1578
·330 DATA48,193,240,23,165,161,201,212,176,4,165,160,1748
·340 DATA240,13,238,32,208,160,0,32,225,255,208,6,1617
·350 DATA32,33,193,76,38,192,232,208,242,200,208,239,1893
·360 DATA32,68,229,169,0,168,174,49,193,32,186,255,1555
·370 DATA173,50,193,162,51,160,193,32,189,255,169,43,1670
·380 DATA166,45,164,46,32,216,255,162,1,189,51,193,1520
·390 DATA168,200,152,201,58,144,2,169,48,157,51,193,1543
·400 DATA201,48,208,3,202,16,234,32,33,193,76,116,1362
·410 DATA164,206,32,208,169,0,170,168,76,219,255,160,1827
·420 DATA1,1,160,0,0,65,72,79,89,33,0,0,500
```

C-128 BUG REPELLENT

```
·10 PRINTCHR$(147)"LOADING AND CHECKING THE DATA[3"."]":J
=4864
·20 FORB=0TO11:READA:IFA<0ORA>255THEN40
·30 POKEJ+B,A:X=X+A:NEXTB:READA:IFA=XTHEN50
·40 PRINT:PRINT"ERROR IN DATA LINE:"PEEK(66)*256+PEEK(65)
:END
·50 X=0:J=J+12:IFJ<5213THEN20
·60 POKE208,0:POKE5213,0:A$="Y":B$=A$:C$="D":D$="DISK":D=
8:PRINTCHR$(147)
·70 INPUT"DO YOU WANT AUTOMATIC SAVES (Y/N)";A$:PRINT:IFA
$="Y"THEN90
·80 PRINT"NO AUTOMATIC SAVES[3"."]":GOTO150
·90 POKE5213,1:INPUT"DISK OR TAPE (D/T)";C$:IFC$<>"D"THEN
D=1:D$="TAPE"
·100 POKE5214,D:D$=D$+" DRIVE":PRINT:INPUT"FILE NUMBER (0
-99)";N
·110 N$=RIGHT$(STR$(N),2):IFN<10THENN$=CHR$(48)+CHR$(N+48
)
·120 F$="BACKUP":PRINT:INPUT"FILENAME";F$:F$=N$+LEFT$(F$,
14):L=LEN(F$)
·130 POKE5215,L:FORJ=1TOL:POKE5215+J,ASC(MID$(F$,J,1)):NE
XTJ:PRINT
·140 PRINT"SAVING DEVICE ** "D$:PRINT"STARTING WITH ** "F
$
·150 PRINT:INPUT"IS THIS CORRECT (Y/N)";B$:IFB$<>"Y"THEN6
0
·160 POKE770,198:POKE771,77:SYS4864:END
·170 DATA32,58,20,169,41,162,19,236,3,3,208,4,955
·180 DATA169,198,162,77,141,2,3,142,3,3,224,19,1143
·190 DATA208,7,32,125,255,79,78,0,96,32,125,255,1292
·200 DATA79,70,70,0,96,162,0,134,251,189,0,2,1053
·210 DATA240,19,201,48,144,9,201,58,176,5,133,251,1485
·220 DATA232,208,238,134,252,165,251,208,3,76,198,77,2042
·230 DATA169,0,166,235,164,236,133,253,133,254,142,47,193
2
·240 DATA20,140,48,20,24,101,22,69,254,230,254,24,1206
·250 DATA101,23,69,254,170,230,254,164,252,185,0,2,1704
·260 DATA133,251,201,34,208,6,165,253,73,255,133,253,1965
·270 DATA201,32,208,4,165,253,240,8,138,24,101,251,1625
·280 DATA69,254,170,44,198,254,230,252,164,251,208,213,23
07
·290 DATA138,41,240,74,74,74,74,24,105,65,141,88,1138
·300 DATA20,138,41,15,24,105,65,141,89,20,32,79,769
·310 DATA20,189,85,20,240,6,32,210,255,232,208,245,1742
·320 DATA174,47,20,172,48,20,24,32,240,255,173,93,1298
·330 DATA20,240,27,165,161,201,212,176,4,165,160,240,1771
·340 DATA17,32,65,20,238,32,208,238,1,214,32,225,1322
·350 DATA255,208,6,32,49,20,76,198,77,232,208,242,1603
·360 DATA200,208,239,32,66,193,173,95,20,162,96,160,1644
·370 DATA20,32,189,255,169,0,170,32,104,255,169,0,1395
·380 DATA174,94,20,168,32,186,255,169,45,174,16,18,1351
·390 DATA172,17,18,32,216,255,162,1,189,96,20,168,1346
·400 DATA200,152,201,58,144,2,169,48,157,96,20,201,1448
·410 DATA48,208,3,202,16,234,32,49,20,141,0,2,955
·420 DATA76,183,77,58,59,32,65,20,206,32,208,206,1222
·430 DATA1,214,169,0,170,168,76,219,255,32,79,20,1403
·440 DATA169,26,141,0,214,173,0,214,16,251,96,162,1462
·450 DATA0,142,0,255,96,19,18,32,32,32,32,146,804
·460 DATA0,1,0,0,65,72,79,89,33,0,0,0,339
```

FLANKSPEED FOR THE C-64 By GORDON F. WHEAT

Flankspeed will allow you to enter machine language *Ahoy!* programs without any mistakes. Once you have typed the program in, save it for future use. While entering an ML program with *Flankspeed* there is no need to enter spaces or hit the carriage return. This is all done automatically. If you make an error in a line a bell will ring and you will be asked to enter it again. To LOAD in a program Saved with *Flankspeed* use LOAD "name",1,1 for tape, or LOAD "name",8,1 for disk. The function keys may be used after the starting and ending addresses have been entered.

f1–SAVEs what you have entered so far.

f3–LOADs in a program worked on previously.

f5–To continue on a line you stopped on after LOADing in the previous saved work.

f7–Scans through the program to locate a particular line, or to find out where you stopped the last time you entered the program. It temporarily freezes the output as well.

```
·100 POKE53280,12:POKE53281,11                              OP
·105 PRINT"[CLEAR][c 8][RVSON][15" "]FLANKSPEED[15" "]";    FP
·110 PRINT"[RVSON][5" "]MISTAKEPROOF ML ENTRY PROGRAM[6" "
 ]"                                                         JP
·115 PRINT"[RVSON][9" "]CREATED BY G. F. WHEAT[9" "]"       FA
·120 PRINT"[RVSON][3" "]COPR. 1987, ION INTERNATIONAL INC.
 [3" "]"                                                    AJ
·125 FORA=54272TO54296:POKEA,0:NEXT                         ND
·130 POKE54272,4:POKE54273,48:POKE54277,0:POKE54278,249:PO
 KE54296,15                                                 NP
·135 FORA=680TO699:READB:POKEA,B:NEXT                       FL
·140 DATA169,251,166,253,164,254,32,216,255,96              FF
·145 DATA169,0,166,251,164,252,32,213,255,96                EK
·150 B$="STARTING ADDRESS IN HEX":GOSUB430:AD=B:SR=B        KP
·155 GOSUB480:IFB=0THEN150                                  OE
·160 POKE251,T(4)+T(3)*16:POKE252,T(2)+T(1)*16              AM
·165 B$="ENDING ADDRESS IN HEX":GOSUB430:EN=B               PE
·170 GOSUB470:IFB=0THEN150                                  PG
·175 POKE254,T(2)+T(1)*16:B=T(4)+1+T(3)*16                  GM
·180 IFB>255THENB=B-255:POKE254,PEEK(254)+1                 HG
·185 POKE253,B:PRINT                                        EC
·190 REM  GET HEX LINE                                      ED
·195 GOSUB495:PRINT": [c P][LEFT]";:FORA=0TO8               KD
·200 FORB=0TO1:GOTO250                                      IH
·205 NEXTB                                                  IJ
·210 A%(A)=T(1)+T(0)*16:IFAD+A-1=ENTHEN340                  FA
·215 PRINT" [c P][LEFT]";                                   EG
·220 NEXTA:T=AD-(INT(AD/256)*256):PRINT" "                  II
·225 FORA=0TO7:T=T+A%(A):IFT>255THENT=T-255                 GL
·230 NEXT                                                   GI
·235 IFA%(8)<>TTHENGOSUB375:GOTO195                         FL
·240 FORA=0TO7:POKEAD+A,A%(A):NEXT:AD=AD+8:GOTO195          IM
·245 REM    GET HEX INPUT                                   PA
·250 GETA$:IFA$=""THEN250                                   GA
·255 IFA$=CHR$(20)THEN305                                   GO
·260 IFA$=CHR$(133)THEN535                                  LM
·265 IFA$=CHR$(134)THEN560                                  IG
·270 IFA$=CHR$(135)THENPRINT" ":GOTO620                     HO
·275 IFA$=CHR$(136)THENPRINT" ":GOTO635                     HE
·280 IFA$>"@"ANDA$<"G"THENT(B)=ASC(A$)-55:GOTO295           MI
·285 IFA$>"/"ANDA$<":"THENT(B)=ASC(A$)-48:GOTO295           DJ
·290 GOSUB415:GOTO250                                       JA
·295 PRINTA$"[c P][LEFT]";                                  PK
·300 GOTO205                                                FA
·305 IFA>0THEN320                                           BI
·310 A=-1:IFB=1THEN330                                      BB
·315 GOTO220                                                FA
·320 IFB=0THENPRINTCHR$(20);CHR$(20);:A=A-1                 BF
·325 A=A-1                                                  FK
·330 PRINTCHR$(20);:GOTO220                                 PH
·335 REM LAST LINE                                          CP
·340 PRINT" ":T=AD-(INT(AD/256)*256)                        KH
·345 FORB=0TOA-1:T=T+A%(B):IFT>255THENT=T-255               OD
·350 NEXT                                                   OB
·355 IFA%(A)<>TTHENGOSUB375:GOTO195                         LH
·360 FORB=0TOA-1:POKEAD+B,A%(B):NEXT                        BO
·365 PRINT:PRINT"YOU ARE FINISHED!":GOTO535                 MB
·370 REM BELL AND ERROR MESSAGES                            LM
·375 PRINT:PRINT"LINE ENTERED INCORRECTLY":PRINT:GOTO415    JK
·380 PRINT:PRINT"INPUT A 4 DIGIT HEX VALUE!":GOTO415        PG
·385 PRINT:PRINT"ENDING IS LESS THAN STARTING!":B=0:GOTO41
 5                                                          IK
·390 PRINT:PRINT"ADDRESS NOT WITHIN SPECIFIED RANGE!":B=0:
 GOTO415                                                    HK
·395 PRINT:PRINT"NOT ZERO PAGE OR ROM!":B=0:GOTO415         DM
·400 PRINT"?ERROR IN SAVE":GOTO415                          JK
·405 PRINT"?ERROR IN LOAD":GOTO415                          IO
·410 PRINT:PRINT:PRINT"END OF ML AREA":PRINT                JO
·415 POKE54276,17:POKE54276,16:RETURN                       BF
·420 OPEN15,8,15:INPUT#15,A,A$:CLOSE15:PRINTA$:RETURN       DH
·425 REM GET FOUR DIGIT HEX                                 IM
·430 PRINT:PRINTB$;:INPUTT$                                 OL
·435 IFLEN(T$)<>4THENGOSUB380:GOTO430                       JD
·440 FORA=1TO4:A$=MID$(T$,A,1):GOSUB450:IFT(A)=16THENGOSUB
 380:GOTO430                                                AK
·445 NEXT:B=(T(1)*4096)+(T(2)*256)+(T(3)*16)+T(4):RETURN    KB
·450 IFA$>"@"ANDA$<"G"THENT(A)=ASC(A$)-55:RETURN            GM
·455 IFA$>"/"ANDA$<":"THENT(A)=ASC(A$)-48:RETURN            NJ
·460 T(A)=16:RETURN                                         IC
·465 REM ADDRESS CHECK                                      OL
·470 IFAD>ENTHEN385                                         HO
·475 IFB<SRORB>ENTHEN390                                    LE
·480 IFB<256OR(B>40960ANDB<49152)ORB>53247THEN395           OB
·485 RETURN                                                 HE
·490 REM ADDRESS TO HEX                                     PM
·495 AC=AD:A=4096:GOSUB520                                  AP
·500 A=256:GOSUB520                                         NF
·505 A=16:GOSUB520                                          LG
·510 A=1:GOSUB520                                           HE
·515 RETURN                                                 JD
·520 T=INT(AC/A):IFT>9THENA$=CHR$(T+55):GOTO530             OC
·525 A$=CHR$(T+48)                                          JI
·530 PRINTA$;:AC=AC-A*T:RETURN                              AA
·535 A$="**SAVE**":GOSUB585                                 IC
·540 OPEN1,T,1,A$:SYS680:CLOSE1                             AB
·545 IFST=0THENEND                                          FB
·550 GOSUB400:IFT=8THENGOSUB420                             PM
·555 GOTO535                                                FI
·560 A$="**LOAD**":GOSUB585                                 PE
·565 OPEN1,T,0,A$:SYS690:CLOSE1                             PO
·570 IFST=64THEN195                                         OI
·575 GOSUB405:IFT=8THENGOSUB420                             CO
·580 GOTO560                                                GN
·585 PRINT" ":PRINTTAB(14)A$                                KA
·590 PRINT:A$="":INPUT"FILENAME";A$                         IO
·595 IFA$=""THEN590                                         HK
·600 PRINT:PRINT"TAPE OR DISK?":PRINT                       HL
·605 GETB$:T=1:IFB$="D"THENT=8:A$="@0:"+A$:RETURN           NP
·610 IFB$<>"T"THEN605                                       KO
·615 RETURN                                                 PH
·620 B$="CONTINUE FROM ADDRESS":GOSUB430:AD=B               DD
·625 GOSUB475:IFB=0THEN620                                  NK
·630 PRINT:GOTO195                                          HN
·635 B$="BEGIN SCAN AT ADDRESS":GOSUB430:AD=B               FK
·640 GOSUB475:IFB=0THEN635                                  LN
·645 PRINT:GOTO670                                          HI
·650 FORB=0TO7:AC=PEEK(AD+B):GOSUB505:IFAD+B=ENTHENAD=SR:G
 OSUB410:GOTO195                                            LM
·655 PRINT" ";:NEXTB                                        LE
·660 PRINT:AD=AD+8                                          CD
·665 GETB$:IFB$=CHR$(136)THEN195                            JD
·670 GOSUB495:PRINT": ";:GOTO650                            KE
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 61 and 62 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

ADRIFT IN A SEA OF FLOATING POINT NUMBERS
FROM PAGE 32

FLOATING POINT CONVERTER

```
·1 REM==================================== NM
·2 REM                                      JD
·3 REM     FLOATING POINT CONVERTER         PB
·4 REM          RUPERT REPORT #60           OF
·5 REM                                      JC
·6 REM==================================== CL
·10 PRINT"[CLEAR]FLOATING POINT CONVERTER
"                                           IN
·15 PRINT "[24"="]"                         IP
·20 X0=SQR(36)   :REM: X0 MUST BE FIRST V
ARIABLE                                     AI
·30 SP$="[39" "]"+CHR$(13)                  OK
·40 DEF FNPTR(M)=PEEK(M)+256*PEEK(M+1)      BG
·60 FALSE=0: TRUE=NOT FALSE: C64=FALSE      GI
·70 IF FRE(0)=FRE(1) THEN C64=TRUE          EH
·80 VP=47: IF C64 THEN VP=45   :REM START
 VARIABLES POINTER                          AD
·90 SV=FNPTR(VP) :REM START VARIABLES       FA
·100 S1=SV+2: S2=SV+3: S3=SV+4: S4=SV+5:
S5=SV+6  :REM STORAGE AREA FOR X0           GP
·110 IF NOT C64 THEN BANK 1                 DI
·200 REM ========= FP TO STORED VALUES == IF
·210 PRINT "(X TO SWITCH MODES; Q TO QUIT
)"                                          IJ
·220 PRINT "ENTER FLOATING PT. VALUE :"     AC
·225 INPUT X$: IF X$="" THEN 260            EE
·230 IF X$="Q" THEN END                     ED
·240 IF X$="X" THEN PRINT "[3"[UP]"]";SP$
;SP$;"[3"[UP]"]": GOTO 310                  DN
·250 X0=VAL(X$)                             MF
·260 V1=PEEK(S1): V2=PEEK(S2): V3=PEEK(S3
): V4=PEEK(S4): V5=PEEK(S5)                 MK
·270 GOSUB 1010                             FK
·280 GOTO 210                               DA
·300 REM ========= STORED VALUES TO FP == GG
·310 PRINT: PRINT "(X TO SWITCH MODES; Q
TO QUIT)"                                   HE
·320 PRINT "ENTER 5 STORED VALUES  (0 TO
255) : "                                    PL
·330 INPUT "FIRST VALUE";X1$: V1=VAL(X1$) DO
·340 IF X1$="X" THEN PRINT "[3"[UP]"]";SP
$;SP$;SP$;"[4"[UP]"]": GOTO 210             AC
·350 IF X1$="Q" THEN END                    PF
·360 INPUT "2ND VALUE";X2$: V2=VAL(X2$)     NC
·370 INPUT "3RD VALUE";X3$: V3=VAL(X3$)     AM
·380 INPUT "4TH VALUE";X4$: V4=VAL(X4$)     PA
·390 INPUT "5TH VALUE";X5$: V5=VAL(X5$)     EG
·400 POKE S1,V1: POKE S2,V2: POKE S3,V3:
POKE S4,V4: POKE S5,V5                      KJ
·410 GOSUB 1010                             OG
·420 GOTO 310                               MF
·1000 REM ===== CONVERSION & OUTPUT ===== AO
·1010 PRINT V1; V2; V3; V4; V5              EG
·1020 REM  -- EXPONENT, MANTISSA, SIGN -- KL
·1030 EX=V1-128                             EA
·1040 MN=(((V5/256+V4)/256+V3)/256 + (128
 OR V2))/256                                CC
·1050 SN=1: IF V2 >= 128 THEN SN=-1         II
·1060 PRINT "[RVSON]"; SN*MN; "[RVSOFF]*
2[UPARROW][RVSON]"; EX; "[RVSOFF] =  [RV
SON]"; X0; "[RVSOFF]": PRINT                KD
·1070 RETURN                                MA
```

TUBULAR
FROM PAGE 18

Starting address in hex: C000
Ending address in hex: CF3F
SYS to start: 49152

Flankspeed **required for entry! See page 63.**

```
C000: 20 AB C5 A9 00 8D 0B DC B0
C008: 8D 0A DC 8D 09 DC 8D 08 85
C010: DC 20 CA C1 20 61 C4 20 FF
C018: 05 C6 20 F4 C1 20 C2 C0 5E
C020: 20 35 C3 20 9A C2 20 48 1F
C028: C2 20 17 C3 20 E8 C0 20 CF
C030: 78 C1 20 E1 FF D0 03 4C 8C
C038: 5F C0 AD F7 C9 C9 10 D0 72
C040: 19 EE E2 C9 AD E2 C9 C9 19
C048: 10 D0 03 4C 3A C1 20 00 94
C050: C1 20 48 C2 20 C2 C0 4C 2D
C058: 20 C0 AD E4 C9 F0 C1 A9 F1
C060: 81 8D 04 D4 A9 E0 8D F8 59
C068: 07 A0 1E A2 FF 8C 00 D4 32
C070: 20 E8 C0 E8 88 8C 01 D4 0E
C078: A9 00 9D 00 38 9D 1A 38 E7
C080: C0 00 D0 EC A9 80 8D 04 BA
C088: D4 AD FF 07 C9 E6 F0 1A CD
C090: 20 A9 C6 20 61 C4 20 48 CF
C098: C2 CE FF 07 A9 00 8D E4 4D
C0A0: C9 8D E3 C9 20 C2 C0 4C 95
C0A8: 20 C0 A2 00 BD 31 C9 9D 82
C0B0: AF 04 A9 06 9D AF D8 E8 23
C0B8: E0 09 D0 F0 20 C2 C0 4C 54
C0C0: 11 C0 A2 00 BD 26 C9 9D 80
C0C8: FE 04 A9 06 9D FE D8 E8 D9
C0D0: E0 0B D0 F0 AD 00 DC C9 D2
C0D8: 6F D0 F9 A2 00 A9 A0 9D 9D
C0E0: FE 04 E8 E0 0B D0 F8 60 E2
C0E8: EE F5 C9 AD F5 C9 D0 F8 CE
C0F0: EE F6 C9 AD F6 C9 C9 18 F0
C0F8: D0 EE A9 00 8D F6 C9 60 11
```

```
C100: AD AE C7 8D 6F C7 AD F1 88
C108: C7 8D B2 C7 AD 14 C8 8D EF
C110: F5 C7 18 AD AE C7 69 10 83
C118: 8D AE C7 18 AD F1 C7 69 05
C120: 0C 8D F1 C7 18 AD 14 C8 16
C128: 69 0E 8D 14 C8 20 A9 C6 9A
C130: 20 F4 C1 20 61 C4 20 AC 1A
C138: C1 60 A2 00 BD 56 C9 9D 78
C140: AF 04 A9 03 9D AF D8 E8 AF
C148: E0 09 D0 F0 A2 00 BD 5F B3
C150: C9 9D 26 07 E8 E0 1B D0 9A
C158: F5 A9 17 8D F7 C1 A9 16 16
C160: 8D 2B C2 20 F4 C1 AD 00 60
C168: DC C9 6F D0 F6 A9 41 8D BE
C170: F7 C1 8D 2B C2 4C 11 C0 C3
C178: AD 09 DC 29 0F C9 00 D0 DE
C180: 01 60 8D 7E C1 CE FA 07 80
C188: AD FA 07 C9 E4 F0 01 60 39
C190: A9 EE 8D FA 07 CE F9 07 88
C198: AD F9 07 C9 E4 F0 01 60 48
C1A0: A9 E5 8D F9 07 8D FA 07 4E
C1A8: EE E4 C9 60 AD FF 07 C9 25
C1B0: EE F0 03 EE FF 07 EE FE 77
C1B8: 07 AD FE 07 C9 EF F0 01 1F
C1C0: 60 A9 E5 8D FE 07 EE FD 31
C1C8: 07 60 A9 00 8D E2 C9 8D A1
C1D0: 6F C7 8D B2 C7 8D F5 C7 5B
C1D8: A9 10 8D AE C7 A9 0C 8D D9
C1E0: F1 C7 A9 0E 8D 14 C8 A0 5D
C1E8: E5 8C FD 07 C8 8C FE 07 BB
C1F0: 8C FF 07 60 A0 00 A9 41 70
C1F8: 8D 04 D4 8D 0B D4 AE F1 6D
C200: C9 BD 98 C9 AA BD 7A C9 96
C208: 8D 00 D4 BD 89 C9 8D 01 0A
C210: D4 AE F1 C9 BD A8 C9 AA 2A
C218: BD 7A C9 8D 07 D4 BD 89 CA
C220: C9 8D 08 D4 20 E8 C0 20 3E
C228: E8 C0 A9 41 8D 04 D4 8D B0
C230: 0B D4 EE F1 C9 C8 C0 10 54
C238: D0 BC A9 40 8D 04 D4 8D A3
C240: 0B D4 A9 00 8D F1 C9 60 73
C248: AD F8 C9 85 FB A9 60 85 C9
C250: FC AE F7 C9 E0 00 F0 10 9F
C258: A5 FB 18 69 80 85 FB A5 23
C260: FC 69 00 85 FC CA D0 F0 D5
C268: A9 76 85 02 A9 05 85 03 47
C270: A2 08 A0 0A B1 FB 91 02 07
C278: 88 10 F9 18 A5 02 69 28 5C
C280: 85 02 A5 03 69 00 85 03 A2
C288: 18 A5 FB 69 80 85 FB A5 53
C290: FC 69 00 85 FC CA 10 DA 2F
C298: 60 60 AD 00 DC C9 7F F0 1E
C2A0: F8 C9 7B D0 1F A2 00 AD 1F
C2A8: F7 C9 DD B8 C9 F0 06 E8 AA
C2B0: E0 0E D0 F3 60 AD F8 C9 35
C2B8: DD D4 C9 F0 DC CE F8 C9 94
C2C0: 20 E7 C2 60 C9 77 D0 1E 1C
C2C8: A2 00 AD F7 C9 DD B8 C9 3B
```

```
C2D0: F0 06 E8 E0 0E D0 F3 60 C4
C2D8: AD F8 C9 DD C6 C9 F0 B9 62
C2E0: EE F8 C9 20 FF C2 60 AD 83
C2E8: F8 07 C9 E2 D0 08 A9 E3 FB
C2F0: 8D F8 07 4C FB C2 A9 E2 16
C2F8: 8D F8 07 CE FA C9 60 AD 28
C300: F8 07 C9 E0 D0 08 A9 E1 0F
C308: 8D F8 07 4C 13 C3 A9 E0 43
C310: 8D F8 07 EE FA C9 60 AC 5E
C318: F2 C9 A2 00 B9 5C C8 9D F3
C320: 6B 31 C8 E8 E0 05 D0 F4 1A
C328: 8C F2 C9 C0 14 D0 05 A0 BC
C330: 00 8C F2 C9 60 A9 00 8D 11
C338: F3 C9 AD FA C9 8D 4A C3 04
C340: AD FB C9 8D 4B C3 AE F3 F2
C348: C9 AD 00 60 9D E5 C9 AD 1B
C350: 4A C3 9D E9 C9 AD 4B C3 6C
C358: 9D ED C9 18 AD 4A C3 69 EA
C360: 80 8D 4A C3 B0 03 4C 6C E8
C368: C3 EE 4B C3 EE F3 C9 AD 84
C370: F3 C9 C9 04 D0 D0 AD E5 31
C378: C9 C9 2A D0 04 20 BC C3 AB
C380: 60 AD E8 C9 C9 29 D0 04 09
C388: 20 F5 C3 60 AD E7 C9 C9 EB
C390: 2D D0 28 A9 17 8D 0B D4 E4
C398: A9 FF 8D 08 D4 AD EB C9 10
C3A0: 8D AC C3 AD EF C9 8D AD 41
C3A8: C3 A9 20 8D 00 60 20 37 7B
C3B0: C4 A0 FF 88 D0 FD A9 16 2D
C3B8: 8D 0B D4 60 A9 00 8D F3 B1
C3C0: C9 A9 81 8D 12 D4 A9 03 D6
C3C8: 8D 0F D4 A9 E4 8D F8 07 56
C3D0: 20 E8 C0 CE F7 C9 20 48 93
C3D8: C2 20 2E C4 EE F3 C9 AD 09
C3E0: F3 C9 C9 04 D0 EA CE F8 EF
C3E8: 07 CE FB C9 CE FB C9 A9 C2
C3F0: 80 8D 12 D4 60 A9 00 8D 7D
C3F8: F3 C9 A9 81 8D 12 D4 A9 FF
C400: 02 8D 0F D4 A9 E4 8D F8 88
C408: 07 20 E8 C0 EE F7 C9 20 A9
C410: 48 C2 20 2E C4 EE F3 C9 DA
C418: AD F3 C9 C9 04 D0 EA CE DB
C420: F8 07 EE FB C9 EE FB C9 89
C428: A9 80 8D 12 D4 60 A0 C8 90
C430: 8C 0E D4 88 D0 FA 60 EE 43
C438: E3 C9 AD E3 C9 C9 0E D0 E9
C440: 03 20 58 C4 EE FC 07 AD 21
C448: FC 07 C9 EF F0 01 60 A9 02
C450: E5 8D FC 07 EE FB 07 60 1A
C458: A9 2A 8D BF 6A 8D 3F 6B 1C
C460: 60 A2 00 8A 9D 00 38 9D 61
C468: 00 39 9D 00 3A 9D 00 3B 52
C470: E8 E0 00 D0 EF A2 00 A0 3E
C478: 00 BD 70 C8 99 00 38 BD FE
C480: 7F C8 99 00 39 C8 C8 C8 F5
C488: E8 E0 0F D0 EC A2 00 BD 7F
C490: 8E C8 9D 43 38 BD B7 C8 3F
C498: 9D 80 38 BD E0 C8 9D C3 B7
```

```
C4A0: 38 E8 E0 29 D0 E9 A9 00 30
C4A8: 8D F3 C9 A0 00 A2 00 BD F4
C4B0: 80 31 99 40 39 C8 C8 C8 CF
C4B8: E8 E0 08 D0 F2 18 AD B3 C7
C4C0: C4 69 40 8D B3 C4 B0 03 E8
C4C8: 4C CE C4 EE B4 C4 18 AD D6
C4D0: B0 C4 69 08 8D B0 C4 EE A9
C4D8: F3 C9 AD F3 C9 C9 0A D0 A6
C4E0: CA A9 31 8D B1 C4 A9 80 B4
C4E8: 8D B0 C4 A9 39 8D B4 C4 D5
C4F0: A9 40 8D B3 C4 A9 03 8D 1B
C4F8: AA 38 A9 C0 8D 01 38 A9 B6
C500: 80 8D 04 38 8D 07 38 A9 C0
C508: 40 8D 22 38 A9 03 8D AA 15
C510: 38 A9 73 8D FA C9 A9 83 E4
C518: 8D FB C9 A2 00 A9 00 9D 55
C520: E3 C9 E8 E0 15 D0 F8 A2 19
C528: 00 BD 7C C5 9D 00 D0 E8 7F
C530: E0 2F D0 F5 A9 64 A2 00 B7
C538: BD 63 C5 9D 00 D4 E8 E0 5B
C540: 19 D0 F5 A9 6E 8D F8 C9 88
C548: A9 44 8D F7 C9 A9 E2 8D 9F
C550: F8 07 A9 E5 8D FA 07 8D FC
C558: FB 07 8D FC 07 A9 EE 8D 13
C560: F9 07 60 00 00 00 08 00 C9
C568: 00 F8 00 00 00 08 00 0A 73
C570: 09 FF 40 00 00 80 69 69 0D
C578: 00 00 00 0F AE 93 4C DE F4
C580: 5C DE 8C DE 9C DE CC DE 4E
C588: DC DE 0C DE 80 1B 00 00 CA
C590: 00 FF D8 FE 1D 00 00 01 86
C598: 01 FE 00 00 0C 00 09 0E BB
C5A0: 01 0B 07 0A 01 01 01 01 C1
C5A8: 01 01 01 AD 0E DC 29 FE 6C
C5B0: 8D 0E DC A5 01 29 FB 85 7A
C5B8: 01 A2 00 BD 00 D0 9D 00 88
C5C0: 30 E8 E0 00 D0 F5 EE BD 2E
C5C8: C5 EE C0 C5 AD C0 C5 C9 02
C5D0: 37 D0 E6 A9 30 8D C0 C5 AD
C5D8: A9 D0 8D BD C5 A5 01 09 14
C5E0: 04 85 01 AD 0E DC 09 01 0E
C5E8: 8D 0E DC A2 00 BD 1C C8 A6
C5F0: 9D 18 31 E8 E0 40 D0 F5 A8
C5F8: A2 00 A9 00 9D 58 31 E8 55
C600: E0 18 D0 F6 60 A9 9A 20 85
C608: D2 FF A9 93 20 D2 FF A2 AD
C610: 00 A9 A0 9D 00 04 9D 00 99
C618: 05 9D 00 06 9D E8 06 E8 36
C620: E0 00 D0 ED A9 9B 20 D2 F7
C628: FF A2 09 A0 0E 18 20 F0 AB
C630: FF A9 20 20 D2 FF C8 C0 76
C638: 19 D0 F2 E8 E0 12 D0 EB AD
C640: A9 9F 20 D2 FF A9 12 20 58
C648: D2 FF A0 0D A2 08 18 20 AB
C650: F0 FF A9 20 20 D2 FF E8 E6
C658: E0 13 D0 F2 A0 19 A2 08 74
C660: 18 20 F0 FF A9 20 20 D2 46
C668: FF E8 E0 13 D0 F2 A2 00 AB
C670: A9 03 9D 4E D9 9D DE DA 3A
C678: E8 E0 0B D0 F3 A2 00 BD 72
C680: 09 C9 9D 25 07 A9 03 9D 67
C688: 25 DB 9D 00 D8 A9 A0 9D E7
C690: 00 04 E8 E0 1D D0 E8 A2 D7
C698: 00 BD 3A C9 9D 0C 04 A9 B1
C6A0: 03 9D 0C D8 E8 E0 1C D0 DC
C6A8: F0 A2 00 A9 23 9D 00 60 07
C6B0: E8 A9 24 9D 00 60 E8 E0 2F
C6B8: 00 D0 F0 EE B5 C6 EE AF 84
C6C0: C6 AD AF C6 C9 A0 D0 E1 C8
C6C8: A9 60 8D AF C6 8D B5 C6 E0
C6D0: A9 00 8D F3 C9 A9 BE 8D BB
C6D8: 19 C8 A9 69 8D 1A C8 A9 E7
C6E0: 02 8D F3 C6 A2 00 A9 25 9C
C6E8: 20 18 C8 E8 A9 20 20 18 D4
C6F0: C8 E8 E0 02 D0 F6 A9 26 1D
C6F8: 20 18 C8 18 AD 19 C8 69 0B
C700: 7F 8D 19 C8 B0 03 4C 0C FA
C708: C7 EE 1A C8 EE F3 C6 EE 3A
C710: F3 C6 EE F3 C9 AD F3 C9 E2
C718: C9 37 D0 C8 A9 00 8D F3 DD
C720: C9 A9 BC 8D 19 C8 A9 6A D3
C728: 8D 1A C8 A9 07 8D 3C C7 DA
C730: 8D 46 C7 A2 00 A9 27 20 5F
C738: 18 C8 E8 E0 01 F0 0A A9 88
C740: 28 20 18 C8 E8 E0 01 D0 05
C748: EC 38 AD 19 C8 E9 04 8D 78
C750: 19 C8 18 AD 3C C7 69 08 6D
C758: 8D 3C C7 8D 46 C7 EE 1A 8E
C760: C8 EE 1A C8 EE F3 C9 AD 55
C768: F3 C9 C9 0E D0 C5 A9 00 3E
C770: 8D F3 C9 AE F3 C9 BD 00 E5
C778: CA 8D 8A C7 BD 00 CB 8D 3A
C780: 8B C7 A9 00 8D F4 C9 A9 73
C788: 2A 8D 00 60 18 AD 8A C7 B8
C790: 69 80 8D 8A C7 B0 03 4C 5A
C798: 9D C7 EE 8B C7 EE F4 C9 ED
C7A0: AD F4 C9 C9 02 D0 E0 EE 79
C7A8: F3 C9 AD F3 C9 C9 10 D0 7C
C7B0: C2 A9 00 8D F3 C9 AE F3 0B
C7B8: C9 BD 00 CC 8D CD C7 BD ED
C7C0: C0 CC 8D CE C7 A9 00 8D A9
C7C8: F4 C9 A9 29 8D 00 60 18 60
C7D0: AD CD C7 69 80 8D CD C7 21
C7D8: B0 03 4C E0 C7 EE CE C7 07
C7E0: EE F4 C9 AD F4 C9 C9 02 C6
C7E8: D0 E0 EE F3 C9 AD F3 C9 B2
C7F0: C9 0C D0 C2 A9 00 8D F3 85
C7F8: C9 AE F3 C9 BD 80 CD 8D C8
C800: 0B C8 BD 60 CE 8D 0C C8 23
C808: A9 2D 8D 00 60 EE F3 C9 79
C810: AD F3 C9 C9 0E D0 E2 60 67
C818: 9D 00 60 60 55 7D 7D 55 1C
C820: D7 DF DF 57 5D DF DF 57 83
C828: D5 F7 F7 D7 7D FD F4 F4 2B
C830: D0 D0 40 40 7D 7F 1F 1F 8D
C838: 07 07 01 01 55 7F 55 FD 70
```

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C840: 55 7F 55 00 55 FF 55 FF 15
C848: 55 FF 05 00 AA A2 A2 A2 35
C850: A2 80 A2 AA 55 51 40 51 F8
C858: 51 51 51 55 00 41 14 41 38
C860: 00 00 82 28 82 00 00 C3 51
C868: 3C C3 00 00 82 14 82 00 81
C870: 0F 3A 3A 0A 05 05 05 05 12
C878: 0D 05 05 01 15 31 03 06 DF
C880: 0F 0F 0F 05 05 15 15 15 F6
C888: 15 15 11 11 11 33 0F C0 E8
C890: 00 3A 80 00 3A 80 00 0A 10
C898: 00 00 05 00 00 05 00 00 A2
C8A0: 05 00 00 05 00 00 05 C0 70
C8A8: 00 05 00 00 05 00 00 10 C2
C8B0: 40 00 40 10 00 C0 30 0F 41
C8B8: C0 00 0A B0 00 0A B0 00 EE
C8C0: 02 80 00 01 40 00 01 40 C5
C8C8: 00 01 40 00 01 40 00 03 4E
C8D0: 40 00 01 40 00 01 40 00 93
C8D8: 05 00 00 01 50 00 01 30 60
C8E0: 0F C0 00 0A B0 00 0A B0 26
C8E8: 00 02 80 00 01 40 00 01 AD
C8F0: 40 00 01 40 00 01 40 00 B3
C8F8: 0D 40 00 01 40 00 01 40 C8
C900: 00 04 10 00 10 04 00 30 58
C908: 0C A0 83 8C 8F 83 8B A0 04
C910: A0 A0 82 85 8C 8C 93 A0 A6
C918: A0 A0 8C 85 96 85 8C A0 B4
C920: A0 A0 8D 85 8E A0 90 92 C6
C928: 85 93 93 A0 A0 86 89 92 B8
C930: 85 87 81 8D 85 A0 8F 96 98
C938: 85 92 94 A0 95 A0 82 A0 DE
C940: 95 A0 8C A0 81 A0 92 A0 F8
C948: A1 A0 A0 A0 A0 A0 A0 A0 4E
C950: A0 A0 A0 A0 A0 A0 A0 81 36
C958: 97 85 93 8F 8D 85 A0 A0 EC
C960: B1 B6 A0 8E 85 97 A0 8C 42
C968: 85 96 85 8C 93 A0 83 8F DD
C970: 8D 89 8E 87 A0 93 8F 8F F0
C978: 8E A0 00 0C E9 61 68 8F F6
C980: 30 8F 18 D2 C3 D1 1F 60 40
C988: 1E 00 07 07 08 09 0A 0B DA
C990: 0C 0E 0F 10 12 15 16 19 20
C998: 05 08 05 08 05 06 05 04 C6
C9A0: 06 05 04 03 02 04 02 01 BB
C9A8: 05 01 01 01 01 04 04 04 BD
C9B0: 04 01 01 01 01 05 05 01 C3
C9B8: 44 40 3C 38 34 30 2C 28 6A
C9C0: 24 20 1C 18 14 10 6E 6A 36
C9C8: 66 62 5E 5A 56 52 4E 4A 8B
C9D0: 46 42 3E 3A 06 0A 0E 12 02
C9D8: 16 1A 1E 22 26 2A 2E 32 F9
C9E0: 36 3A 00 00 00 00 00 00 51
C9E8: 00 00 00 00 00 00 00 00 E8
C9F0: 00 00 00 00 00 00 00 00 F0
C9F8: 00 00 73 83 00 00 00 00 EF
CA00: C0 B7 AD B9 A9 BF AF B7 B0
CA08: BD B7 C3 C1 C1 C1 C1 C1 0A
CA10: AA DA B5 C2 D0 AC BC D0 19
CA18: C7 BA C8 BC C0 C0 C0 C0 23
CA20: E1 E1 E1 D5 AB BB AF BF 72
CA28: BF C3 C0 BD C5 BB BB BB 23
CA30: D1 9D C5 CB BF BF B5 C9 30
CA38: B7 CF C9 BF C3 BB BB BB 40
CA40: BF BF D5 D5 D5 BF BF C9 8A
CA48: C9 BF BF C3 BD BD BD BD 4C
CA50: A3 A9 9B A0 BF BF B5 BF CE
CA58: B1 B9 BF BF BF BF BF BF 42
CA60: B7 B7 B7 B7 C1 BC C9 A9 31
CA68: C3 AF B4 BC B4 BF B9 BB 37
CA70: CF CD CB C9 A4 C7 A6 C1 78
CA78: C5 AA BE B9 B9 B9 B9 BB 4A
CA80: C1 C4 C8 CE D6 BF BF BF B4
CA88: C7 BF C7 B3 C7 BB BB BB 86
CA90: BF BF A9 C3 C7 C3 C3 BF 8C
CA98: C7 A9 B5 B5 B5 C8 C4 C1 7A
CAA0: BF BF BF BF BF BF BF BF 9E
CAA8: BF BF BF BF BF BF BF BF A6
CAB0: DB D9 D7 D5 D3 D4 BF BF 3C
CAB8: C0 B6 CC C4 C6 C8 BF BF D0
CAC0: AD D0 AA D2 A7 D4 C9 C6 C9
CAC8: C3 C0 BD B0 BC B3 B6 BB 9E
CAD0: C9 C9 AF CD AF B9 E1 AF DC
CAD8: DB CB AF BF BB BF BF BF EA
CAE0: B7 B7 CF CF C1 CF C1 AF F2
CAE8: C1 B0 C1 BD C1 C1 C1 C1 E1
CAF0: BD BB DA DA 9E AB AB D4 EA
CAF8: CE CE B8 B8 CE C3 C3 BB 1A
CB00: 82 80 7E 7C 7A 7A 78 76 E1
CB08: 74 72 70 6E 6C 6C 6C 6C 7F
CB10: 82 80 7E 7C 7A 78 76 76 ED
CB18: 74 72 70 6E 6C 6C 6C 6C 8F
CB20: 82 80 7E 7C 7A 7A 78 76 02
CB28: 74 72 70 6E 6E 6C 6C 6C A1
CB30: 82 80 80 7E 7C 7A 78 76 18
CB38: 74 74 72 70 6E 6C 6C 6C B7
CB40: 82 80 80 7E 7C 7A 78 76 28
CB48: 74 72 70 6E 6C 6C 6C 6C BF
CB50: 82 80 7E 7C 7C 7A 78 78 36
CB58: 76 74 72 70 6E 6C 6C 6C D9
CB60: 82 80 7E 7C 7C 7A 7A 78 48
CB68: 78 76 74 72 70 70 6E 6C F9
CB70: 82 80 7E 7C 7A 7A 78 78 54
CB78: 78 76 76 74 72 70 6E 6C 10
CB80: 82 80 7E 7C 7A 78 76 74 5C
CB88: 74 72 72 70 6E 6C 6C 6C 06
CB90: 82 80 7E 7E 7C 7A 7A 78 7A
CB98: 78 76 76 74 72 70 6E 6C 30
CBA0: 82 80 7E 7C 7A 78 76 74 7C
CBA8: 72 70 6E 6C 6C 6C 6C 6C 18
CBB0: 82 80 7E 7C 7A 78 76 74 8C
CBB8: 72 70 70 6E 6E 6E 6C 6C 30
CBC0: 82 82 80 80 7E 7E 7C 7A BA
CBC8: 78 76 74 72 72 70 6E 6C 5C
CBD0: 82 80 7E 7E 7C 7C 7C 7A C0
CBD8: 7A 78 76 74 72 70 6E 6C 74
```

```
CBE0: 82 80 80 7E 7C 7C 7A 78 CE
CBE8: 78 76 74 72 70 6E 6C 6C 76
CBF0: 82 80 80 7E 7C 7C 7A 7A E0
CBF8: 78 76 74 72 72 70 6E 6C 8C
CC00: D3 C1 A5 B1 C1 C6 C6 C6 03
CC08: C6 C6 C6 C6 9A E8 9F 9C E2
CC10: E2 DE C5 CB C3 C3 C3 C3 72
CC18: D1 A5 D1 A5 A5 B3 C4 C2 E7
CC20: C2 C2 C2 C2 AB D1 A5 C9 18
CC28: A9 AB B1 B1 B1 B1 B1 B1 A7
CC30: D7 CB D7 AB D7 AB B1 B7 44
CC38: CD BB C6 C6 B0 D5 B0 D5 5C
CC40: B0 D5 B0 D5 D5 C7 C7 C7 7A
CC48: BB BB BF BE BE BE BE BE 39
CC50: BE BE BE BE CC CA C8 C6 72
CC58: A7 C4 C3 B6 B6 B6 B6 C3 27
CC60: DE A5 DE A5 DE A5 DE A5 72
CC68: DE A5 A5 A5 B7 CA B9 CA 3F
CC70: AD CA B1 CA CA CA CA CA 90
CC78: A7 DA A5 AB D6 DC A5 AB 51
CC80: D6 DC A8 D9 BF BE CA BF BF
CC88: BE CA BF B8 B7 BD C5 C7 8D
CC90: C3 A0 DD A1 DC BA BA B5 7C
CC98: BA BA BA BA B4 B3 B5 B2 54
CCA0: B4 DA CA B0 CB CB CB CB DA
CCA8: E5 B5 B9 E5 E5 B1 CC D2 1B
CCB0: B1 B1 B1 B1 9C DC EB 98 75
CCB8: EB A0 A0 D1 DB DB C1 C1 F2
CCC0: 82 7C 7A 7A 7A 72 72 72 86
CCC8: 72 72 72 72 82 80 7E 7C 90
CCD0: 7C 7A 76 70 6C 6C 6C 6C 60
CCD8: 80 7E 7E 7C 7A 7A 74 6E AA
CCE0: 6E 6E 6E 6E 80 7E 7A 7A 8E
CCE8: 78 76 74 74 74 74 74 74 92
CCF0: 82 80 80 7E 7E 7C 7A 78 E0
CCF8: 74 70 70 6E 82 82 80 80 C2
CD00: 7E 7E 7C 7C 7A 76 74 72 CD
CD08: 7E 7C 7C 7A 78 76 74 72 CF
CD10: 72 72 72 72 82 80 7E 7C D7
CD18: 7A 7A 78 74 72 70 70 76 C3
CD20: 82 80 80 7E 7E 7C 7C 7A 14
CD28: 7A 78 78 78 7C 7C 7A 7A F9
CD30: 78 78 76 76 74 72 70 70 D5
CD38: 82 82 80 80 80 80 7E 7E 3C
CD40: 7E 7E 7C 7C 82 80 80 7E 38
CD48: 7C 7C 7A 76 74 70 6E 6E F3
CD50: 82 80 80 7E 7E 7A 78 76 3A
CD58: 76 74 72 72 80 7E 7E 7C 22
CD60: 7C 7C 7A 72 70 70 70 70 08
CD68: 82 80 80 80 7E 7C 7C 7C 60
CD70: 7A 78 78 78 82 82 82 80 5C
CD78: 80 7E 7C 7C 7A 78 74 72 4A
CD80: 47 5D 6B 39 2F 37 3E 2B 99
CD88: 2B 35 3B 39 42 40 22 50 52
CD90: 61 6A 2A 1E 4D 56 3C 40 C4
CD98: 4B 4A 42 41 48 54 5D 54 FF
CDA0: 5D 2D 47 2D 3A 41 41 41 9D
CDA8: 44 42 57 39 24 4E 5D 3B CA
```

```
CDB0: 41 2F 2A 34 4C 43 3D 42 8E
CDB8: 3E 40 56 54 56 2D 33 3E D6
CDC0: 40 48 4A 3E 40 45 3B 2F C1
CDC8: 1C 2F 2F 31 3E 40 37 33 5D
CDD0: 3E 33 3E 40 3B 4D 29 36 A8
CDD8: 39 3D 48 2A 3D 2A 35 3D 9B
CDE0: 35 3A 4B 4E 49 4C 47 4A 11
CDE8: 45 48 43 46 42 44 26 40 EC
CDF0: 45 5F 49 5F 24 4F 5F 1E 2F
CDF8: 57 5F 40 48 40 40 41 2B 25
CE00: 41 35 45 39 49 52 23 46 F9
CE08: 3D 33 52 40 28 59 28 59 0E
CE10: 28 59 40 3E 40 3E 40 3E 0D
CE18: 40 3E 40 58 40 40 54 40 44
CE20: 40 51 37 37 45 47 4B 46 3E
CE28: 29 54 26 55 24 57 4F 4C 38
CE30: 49 46 43 2F 34 43 35 47 26
CE38: 4B 33 35 34 45 1E 38 5C 18
CE40: 30 2D 52 40 36 38 37 4E 24
CE48: 50 4E 50 40 25 5A 29 40 60
CE50: 37 40 11 6A 2F 55 1E 55 3B
CE58: 27 5A 4B 50 2D 4F 34 3F 65
CE60: 84 84 84 82 80 7E 7E 7C 6A
CE68: 7A 78 76 72 70 6C 84 84 2A
CE70: 82 82 80 7E 7E 7C 7A 78 62
CE78: 76 72 70 6E 82 82 82 80 48
CE80: 80 7C 7C 7A 78 76 74 72 4A
CE88: 70 6C 84 82 80 80 80 7C 6A
CE90: 7C 7A 78 76 74 72 70 6C 3A
CE98: 82 82 80 7E 7E 7C 7A 7A 8C
CEA0: 7A 76 76 72 72 6E 84 82 62
CEA8: 80 80 7E 7E 7C 7C 7A 78 92
CEB0: 78 76 74 6E 84 82 80 80 8A
CEB8: 7C 7C 7C 78 78 76 74 72 7C
CEC0: 70 6E 82 82 80 80 7E 7E A2
CEC8: 7C 7C 7A 7A 78 78 7C 76 9A
CED0: 82 82 80 80 7E 7E 7E 7C CE
CED8: 7C 7C 78 74 6E 6C 82 80 9C
CEE0: 80 7E 7E 7C 7C 7C 7A 7A C8
CEE8: 78 74 74 6C 82 82 80 80 BC
CEF0: 7E 7E 7A 78 76 74 72 70 AE
CEF8: 6E 6C 82 82 80 7E 7E 7C D2
CF00: 7A 7A 76 72 70 70 70 6E 9D
CF08: 82 82 80 80 7E 7E 7C 7A 02
CF10: 78 76 74 72 70 6C 82 82 C7
CF18: 82 80 80 7E 7E 7C 7C 7C 0E
CF20: 78 74 74 72 82 82 80 7E F7
CF28: 7E 7C 7C 7A 78 78 76 76 F7
CF30: 6E 6C 84 80 7E 7E 7C 7C 06
CF38: 78 78 76 76 74 72 70 6C D9
```

PROBLEMS ENTERING A PROGRAM?

For assistance, call 212-239-6089 (if busy or no answer after three rings, call 212-239-0855).

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 61 and 62 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

SCREENSAVER64
FROM PAGE 55

BASIC LOADER

```
100 REM *** SCREENSAVER 64 ***                  IH
110 SS=51200:REM RELOCATING ***                 PI
120 CK=0                                        OL
130 READD:CK=CK+D:IFD=999THEN150                AG
140 GOTO130                                     KO
150 IFCK<>20519THENPRINT"[3"*"] ERROR IN
 DATA [3"*"]":END                               MB
160 RESTORE:SA=SS                               GB
170 READD:IFD=999THEN220                        CA
180 IFD=>0THENPOKESA,D:GOTO210                  MN
190 AD=SS+ABS(D):H=AD/256:L=AD-INT(AD/25
6)*256                                          LJ
200 POKESA,L:SA=SA+1:POKESA,H                   CA
210 SA=SA+1:GOTO170                             OH
220 PRINT"SCREENSAVER INSTALLED"SS"TO"SA        JK
230 PRINT                                       IB
240 PRINT"TO SAVE SCREEN: SYS"SS                JL
250 PRINT"RECALL SCREEN : SYS"SS+3              KK
260 PRINT"CLEAR LINKS[3" "]: SYS"SS+6           AJ
270 PRINT"MOVE STORAGE  : POKE"SS+9"[LEF
T], HIGH-BYTE"                                  CM
280 END                                         JJ
290 DATA 184,80,7,184,80,85,184,80              FF
300 DATA 70,208,173,136,2,32,-160,173           GA
310 DATA -9,133,196,132,195,32,-194,169         EN
320 DATA 216,32,-160,32,-191,32,-245,160        AA
330 DATA 24,185,217,0,32,-220,136,16            FI
340 DATA 247,160,25,165,199,32,-220,200         EL
350 DATA 173,134,2,32,-220,56,32,240            OO
360 DATA 255,138,72,152,160,27,32,-220          BB
370 DATA 104,200,76,-220,162,24,181,217         NF
380 DATA 9,128,149,217,202,16,247,96            AI
390 DATA 173,-9,32,-160,173,136,2,32            LB
400 DATA -176,24,165,175,105,4,162,208          JB
410 DATA 134,174,133,175,169,216,32,-176        OO
420 DATA 160,24,32,-205,153,217,0,136           FH
430 DATA 16,247,160,25,32,-205,133,199          KB
440 DATA 200,32,-205,141,134,2,200,32           NA
450 DATA -205,72,200,32,-205,170,104,168        AN
460 DATA 24,76,240,255,160,0,133,173            LN
470 DATA 132,172,24,105,3,133,175,169           ON
480 DATA 232,133,174,96,132,195,133,196         LM
490 DATA 32,-205,145,195,32,-237,208,246        BB
500 DATA 96,32,-245,177,172,32,-220,32          KO
510 DATA -237,208,246,96,162,52,8,120           EJ
520 DATA 165,1,134,1,170,177,172,134            HL
530 DATA 1,40,96,162,52,8,120,72                NE
540 DATA 165,1,134,1,170,104,145,195            JK
550 DATA 134,1,40,96,32,219,252,32              BM
560 DATA 209,252,240,6,230,195,208,2            PC
570 DATA 230,196,96,999                         LB
```

DEMO

```
100 SS=51200                                    LB
110 POKESS+9,53248/256:REM START OF STOR
AGE                                             EM
120 P$="[RVSON]PRESS A KEY[RVSOFF]"             HP
130 SYS65409:REM DEFAULT SCREEN SET UP          CP
140 D=5:R=0:GOSUB590                            HB
150 PRINT"WHEN PRINTING MESSAGE BOXES AN
D PSEUDO  WINDOWS ON THE C-64 SCREEN,";         IA
160 PRINT" THINGS DON'TALWAYS WORK OUT A
S PLANNED.":TT=2:GOSUB620                       AB
170 PRINT:PRINT"LINES THAT WRAP CAN DISR
UPT YOUR NICE,  NEAT BOX[3"."]":GOSUB620        KF
180 PRINT"[DOWN]"TAB(10)P$                      DF
190 GOSUB640                                    OM
200 SYS SS:REM SAVE SCREEN                      LD
210 C=1:GOSUB430                                EN
220 GOSUB640                                    AG
230 SYS SS+3:REM RECALL SCRN                    JP
240 GOSUB620                                    BE
250 PRINT"[UP]BUT, IF YOU SET BIT 7 OF L
OCATIONS 217  THRU 242,";:GOSUB620              DO
260 PRINT" WRAPPED LINES ARE UN-LINKED[3
" "]AND THE BOX COMES OUT AS PLANNED.           DP
270 GOSUB620:PRINT"[DOWN]"TAB(R)P$:GOSUB
640                                             II
280 SYS SS:SYS SS+6:C=3:GOSUB430                JH
290 GOSUB640:SYS SS+3                           JJ
300 GOSUB620                                    FD
310 PRINT"[UP][GREEN]NOW EXECUTING MULTI
PLE SCREEN SAVES[3"."]"                         FG
320 GOSUB620                                    GP
330 W=16:H=4:D=3:R=5                            OM
340 FORC=1TO4:SYS SS                            GK
350 POKESS+9,PEEK(SS+9)+8:REM MOVE STORA
GE                                              HD
360 POKE646,C:D=D+2:R=R+2:GOSUB480              BD
370 NEXT                                        PF
380 GOSUB620:GOSUB590:PRINT"[DOWN][DOWN]
[RIGHT][RIGHT]"P$;:GOSUB640                     HE
390 FORC=1TO4:POKESS+9,PEEK(SS+9)-8             AL
400 SYSSS+3                                     KC
410 TT=.5:GOSUB620:NEXT                         HC
420 END                                         CF
430 POKE646,C:W=22:H=8:D=4:R=6:RV$="[RVS
ON]":GOSUB490                                   GH
440 D=8:R=12:GOSUB590:PRINTRV$"LIKE THIS
"                                               FL
450 GOSUB620:PRINT"[YELLOW][3"[DOWN]"]"T
AB(R-1)P$;                                      GO
460 RETURN                                      FL
```

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```
470 REM *** PRINT BOX ***                          KP
480 SYS SS+6:REM CLEAR LINKS                       MG
490 GOSUB590                                       BF
500 PRINTRV$"[c A]";                               II
510 FORI=1TOW-2:PRINT"[s *]";:NEXT:PRINT
"[c S]"                                            BL
520 FORI=1TOH:PRINTTAB(R);                         MK
530 PRINTRV$"[s -]";:FORJ=1TOW-2:PRINT"
";:NEXT:PRINT"[s -]":NEXT                          EK
540 PRINTTAB(R)RV$;                                NP
550 PRINT"[c Z]";:FORI=1TOW-2:PRINT"[s *
]";:NEXT                                           AC
560 PRINT"[c X]"                                   NF
570 RETURN                                         MK
580 REM                                            NH
590 POKE214,D-1:PRINT:REM VERTICAL POSIT
ION                                                CA
600 PRINTTAB(R);:REM HORIZ POS.                    OI
610 RETURN                                         PC
620 REM TIME DELAY                                 JD
630 FORT=1TO1000*TT:NEXT:RETURN                    FC
640 REM WAIT FOR KEY PRESS                         LG
650 POKE198,0:WAIT198,1:RETURN                     ML
```

TRI WORDS
FROM PAGE 18

MAIN PROGRAM

```
10 REM ***************************                 LN
20 REM *  TRI WORDS                   *            IE
30 REM *  BOB BLACKMER                *            BD
40 REM *  6118 S. BRIAR BAYOU         *            BN
50 REM *  HOUSTON,TX 77072            *            EG
60 REM ***************************                 NH
70 RN=RND(-TI)                                     NI
80 IFPEEK(4864)<>1THENBLOAD "WORDLIST"             JK
90 PRINT"[CLEAR] SETTING UP[3"."]1 MINUT
E":POKE54,56:POKE58,56:CLR:DIMNU(15),PO(
16),K(16),W$(400)                                  NL
100 DEF FNA(X)=NU((CCAND240)/16):DEF FNB
(X)=NU(CCAND15):DEF FNC(X)=PEEK(AA+NL+IL
):DEF FND(X)=BB+2*(NL+IL)+1                        JJ
110 COLOR0,1:COLOR4,12:GOSUB740:GOSUB610           NH
120 X1=3:Y1=2:X2=30:Y2=2:SUM=0:QU=0:W=0:
S1=0:S2=0:C1$="[CYAN]":C2$="[CYAN]":POKE
3692,0:POKE3693,19                                 AD
130 REM ***** MAIN LOOP *****                      OD
140 GOSUB210:IFQUTHENGOSUB320:IFWTHENF$=
"I'M STUMPED":GOSUB470:F$=" WE  TIED ":G
OSUB480:GOTO190:ELSEIFQUTHEN180                    MK
150 GOSUB320:IFWTHEN170                            BA
160 GOTO140                                        LJ
170 F$="[WHITE]I'M STUMPED":GOSUB470:F$=
"[CYAN]!YOU  WIN!":GOSUB480:GOTO190                BK
180 F$="[WHITE]! I  WIN !":GOSUB470:F$="
[YELLOW]NICE  GAME":GOSUB480                       BD
190 CHAR1,14,24,"[c 1]PRESS ANY KEY":POK
E208,0:WAIT208,1:RESTORE1070:GOSUB610:GO
TO120                                              PO
200 REM ***** YOUR TURN *****                      IG
210 F$="[WHITE]YOUR  TURN":GOSUB470:CHAR
1,18,22:Q=3:GOSUB510:F$="[10" "]":GOSUB4
70:GOSUB480:IFN$="[3"@"]"THENQU=1:RETURN           CC
220 FORL=1TO3:POKE249+L,ASC(MID$(N$,L,1)
)-64:NEXT:SYS3584:IFPEEK(253)THENF$="[PU
RPLE]NO DOUBLES":GOSUB490:GOTO210                  AG
230 B=0:FORV=1TO3:FORS=1TO16:IFASC(MID$(
N$,V,1))-64<>K(S)THEN240:ELSEB=B+1                 HN
240 NEXTS,V                                        EO
250 IFB<>3THENF$="[c 3][UPARROW][UPARROW
] LOOK [UPARROW][UPARROW]":GOSUB490:GOTO
210                                                FL
260 SYS3615:IFPEEK(253)THENF$="[c 6]NOT
A WORD":GOSUB490:GOTO210                           JH
270 GOSUB430:IFWOTHENF$="[YELLOW]WORD  U
SED":GOSUB490:GOTO210                              CN
280 CHAR1,X1,Y1,C1$+N$:SUM=SUM+1:W$(SUM)
=N$:Y1=Y1+1:IFY1=22ANDX1=3THENY1=2:X1=7:
ELSEIFY1=22THENY1=2:X1=3                           HB
290 S1=S1+1:IF(S1=40ORS1=120)THENC1$="[Y
ELLOW]":ELSEIF(S1=80ORS1=160)THENC1$="[C
YAN]"                                              AL
300 CHAR1,0,23:PRINTTAB(7)"[WHITE]:";S1:
PLAY "V104T8HFV2O4T2IADEFV1QFV2QD":RETUR
N                                                  EK
310 REM ***** 128'S TURN *****                     PJ
320 F$="[WHITE] MY  TURN ":GOSUB470                JH
330 CHAR1,15,22,"[CYAN]THINKING.."                 DJ
340 SYS3694:IFPEEK(254)THENW=1:RETURN              OE
350 B=0:FORV=250TO252:FORS=1TO16:IFPEEK(
V)<>K(S)THEN360:ELSEB=B+1                          NP
360 NEXTS,V:IFB<>3THEN340                          JE
370 N$="":FORL=1TO3:N$=N$+CHR$(PEEK(L+24
9)+64):NEXT:GOSUB430:IFWOTHEN340                   FE
380 F$="[10" "]":GOSUB470:GOSUB480                 CG
390 CHAR1,X2,Y2,C2$+N$:SUM=SUM+1:W$(SUM)
=N$:Y2=Y2+1:IFY2=22ANDX2=30THENY2=2:X2=3
4:ELSEIFY2=22THENY2=2:X2=30                        NH
400 S2=S2+1:IF(S2=40ORS2=120)THENC2$="[Y
ELLOW]":ELSEIF(S2=80ORS2=160)THENC2$="[C
YAN]"                                              ID
410 CHAR1,0,23:PRINTTAB(34)"[WHITE]:";S2
:PLAY "V1O2T8QAV2O3T2QCV1QCV2QDV1QAV2QF"
:RETURN                                            AJ
420 REM ***** WORD USED *****                      AI
430 WO=0:FORL=1TOSUM:IFW$(L)=N$THENWO=1            BK
440 NEXTL:RETURN                                   FA
450 REM ***** PRINT ROUTINES *****                 ON
460 POKELOC,LR:POKELOC+40,LR+1:POKELOC+1
,LR+2:POKELOC+41,LR+3:RETURN                       OI
470 CHAR1,15,20,F$:RETURN                          FG
```

```
·480 CHAR1,15,22,F$:RETURN                  KC
·490 CHAR1,15,20,F$:GOSUB590:SLEEP2:RETUR
N                                           PE
·500 REM ***** INPUT ROUTINE *****          MF
·510 N$="":ZL=LEN(N$):POKE208,0:PRINTCHR$
(43)CHR$(157);                              KP
·520 GETZ$:Z=ASC(Z$):IF(Z=13ORZ=20)THEN53
0:ELSEIF(Z<64ORZ>90)THEN520                 BF
·530 ZL=LEN(N$):IFZL=QTHEN550               ML
·540 IFZ>20THENN$=N$+Z$:PRINTZ$CHR$(43)CH
R$(157);:GOTO520                            BG
·550 IFZ=13ANDZL=QTHENRETURN                NP
·560 IFZ=20ANDZLTHENN$=LEFT$(N$,ZL-1):PRI
NTCHR$(32)CHR$(157)CHR$(157)CHR$(43)CHR$
(157);                                      EN
·570 GOTO520                                FL
·580 REM ***** BUZZER *****                 DF
·590 SOUND3,1200,20,0,0,0,1:RETURN          EM
·600 REM ***** DRAW SCREEN *****            HP
·610 PRINT"[CYAN][CLEAR][5"[DOWN]"]"TAB(9
)"[YELLOW]N[RED]ORMAL OR [YELLOW]S[RED]U
PER BRAIN"                                  OB
·620 GETLV$:IFLV$<>"N"ANDLV$<>"S"THEN620    PE
·630 IFLV$="N"THENPOKE3737,24:ELSEPOKE373
7,25                                        BN
·640 PRINT"[RED][CLEAR]":READLOC:FORL=1TO
3:READLR:GOSUB460:LOC=LOC+2:NEXT:READLOC
:FORL=1TO5:READLR:GOSUB460:LOC=LOC+2:NEX
T                                           LH
·650 A$=CHR$(40):B$=CHR$(41):TP$="[BLUE]$
[7"*"]%":BT$="[BLUE]&[7"*"]'":BX$="[c 2]
$**%[DOWN][4"[LEFT]"]([YELLOW]  [c 2])[D
OWN][4"[LEFT]"]([YELLOW]  [c 2])[DOWN][4
"[LEFT]"]&**'":SC$="[GREEN]WORDS[WHITE]:
[3" "]"                                     PH
·660 PRINTTAB(2)TP$TAB(29)TP$:FORL=2TO21:
CHAR1,2,L,A$:CHAR1,10,L,B$:CHAR1,29,L,A$
:CHAR1,37,L,B$:NEXT:PRINT:PRINTTAB(2)BT$
TAB(29)BT$                                  II
·670 FORA=12TO24STEP4:FORB=3TO15STEP4:CHA
R1,A,B,BX$:NEXT:NEXT:CHAR1,0,23:PRINTTAB
(2)SC$TAB(29)SC$                            DN
·680 REM ***** PICK 16 LETTERS *****        LP
·690 FORL=1TO16                             GO
·700 RN=INT(RND(1)*26)+1                    EN
·710 FORE=1TOL:IFK(E)=RNTHEN700:ELSEIFK(E
)<>RNTHENNEXTE                              PO
·720 K(L)=RN:IFK(L)=0THEN700:ELSENEXTL:FO
RL=1TO16:LOC=PO(L):LR=(K(L)*4)+64:GOSUB4
60:NEXT:RETURN                              KN
·730 REM ***** INITIALIZE *****             NH
·740 BANK14:FORI=0TO2047:POKEI+14336,PEEK
(I+53248):NEXT:BANK15                       HJ
·750 FORL=1TO15:READNU(L):NEXT              GI
·760 FOROL=8TO208STEP8:AA=14336+OL:BB=148
48+4*OL:FORIL=0TO4STEP4:FORNL=0TO3:CC=FN
C(0):DD=FND(0):XX=FNA(0):YY=FNB(0)          JP
·770 POKEDD,XX:POKEDD+1,XX:POKEDD+16,YY:P
OKEDD+17,YY:NEXT NL,IL,OL                   AP
·780 FORL=14624TO14687:READA:POKEL,A:NEXT
:FORL=1TO16:READPO(L):NEXT                  ED
·790 CK=0:FORL=3584TO3742:READA:CK=CK+A:P
OKEL,A:NEXT:IFCK<>19489THENPRINT"ERROR I
N LINES 870-1060"                           JE
·800 POKE2604,(PEEK(2604)AND240)+14:RETUR
N                                           OL
·810 REM ***** CHAR AND LOC DATA *****      DL
·820 DATA 3,12,15,48,51,60,63,192,195,204
,207,240,243,252,255                        KO
·830 DATA 0,0,0,31,31,28,28,28,0,0,0,248,
248,56,56,56,28,28,28,31,31,0,0,0,56,56,
56,248,248,0,0,0                            EJ
·840 DATA 28,28,28,28,28,28,28,28,56,56,5
6,56,56,56,56,56,0,0,0,255,255,0,0,0,0,0
,0,0,0,0,0,255                              CM
·850 DATA 1197,1201,1205,1209,1357,1361,1
365,1369,1517,1521,1525,1529,1677,1681,1
685,1689                                    EM
·860 REM ***** ML ROUTINE DATA *****        FE
·870 DATA 169,0,133,253,165,250,197,251     BJ
·880 DATA 240,15,197,252,240,11,165,251     CA
·890 DATA 197,252,240,5,169,0,133,253       AL
·900 DATA 96,230,253,96,0,0,19,169          FD
·910 DATA 0,141,29,14,169,19,141,30         JL
·920 DATA 14,173,30,14,141,57,14,160        MN
·930 DATA 0,140,28,14,174,29,14,189         PO
·940 DATA 0,19,217,250,0,208,3,238          IL
·950 DATA 28,14,232,200,192,3,208,239       GA
·960 DATA 142,29,14,173,28,14,201,3         IJ
·970 DATA 240,21,224,255,208,211,232,142    OG
·980 DATA 29,14,238,30,14,173,30,14         PK
·990 DATA 201,25,208,197,230,253,96,169     JF
·1000 DATA 0,133,253,96,0,19,173,109        NJ
·1010 DATA 14,141,125,14,160,0,132,254      CP
·1020 DATA 174,108,14,189,0,19,153,250      BP
·1030 DATA 0,232,200,192,3,208,244,142      OP
·1040 DATA 108,14,224,255,208,16,232,142    DA
·1050 DATA 108,14,238,109,14,173,109,14     AP
·1060 DATA 201,25,208,2,230,254,96          GJ
·1070 DATA 1035,144,136,100,1043,156,124,
136,80,140                                  LI
```

TRI.DATA

```
·10 CK=0:FORL=4864TO6399:READA:CK=CK+A:PO
KEL,A:NEXT:IFCK<>17381THENPRINT"ERROR IN
 DATA":STOP                                 GN
·20 PRINT"[CLEAR][5"[DOWN]"] READY TO WRI
TE WORD FILE":PRINT" PRESS ANY KEY WHEN
READY"                                      KF
·30 POKE208,0:WAIT208,1:BSAVE"WORDLIST",B
0,P4864 TO P6400                            EG
·40 DATA 1,3,5,1,3,20,4,21                  KH
·50 DATA 2,4,21,5,4,21,7,7                  PE
·60 DATA 1,19,7,1,25,7,5,13                 NI
·70 DATA 2,15,23,2,15,24,6,15               OI
```

```
•80 DATA 7,6,15,5,2,21,14,12 OB
•90 DATA 5,20,12,5,7,12,1,23 LB
•100 DATA 13,15,16,13,21,4,13,15 JO
•110 DATA 23,20,15,5,20,9,16,16 OM
•120 DATA 1,4,16,1,14,19,11,25 KI
•130 DATA 19,11,9,19,5,23,19,5 PN
•140 DATA 20,13,1,25,13,5,14,22 BP
•150 DATA 1,14,22,1,20,18,9,2 MF
•160 DATA 23,15,14,2,21,4,2,21 HP
•170 DATA 7,1,14,25,1,16,5,3 MI
•180 DATA 1,14,2,1,20,7,9,14 IA
•190 DATA 7,5,20,9,14,11,1,18 HI
•200 DATA 20,6,21,14,8,1,25,8 FG
•210 DATA 5,25,12,9,16,12,9,20 FE
•220 DATA 8,15,20,8,15,7,8,15 OD
•230 DATA 16,5,14,4,3,15,23,3 EK
•240 DATA 21,16,10,1,13,13,1,14 HB
•250 DATA 14,5,23,20,1,14,18,21 II
•260 DATA 14,16,21,20,14,1,16,14 FM
•270 DATA 15,23,20,1,18,23,8,25 DF
•280 DATA 23,8,15,20,15,25,20,18 IC
•290 DATA 25,19,9,20,18,1,14,13 DD
•300 DATA 9,24,19,9,16,23,1,18 PE
•310 DATA 1,7,5,1,18,5,4,9 OP
•320 DATA 13,4,9,7,7,21,14,8 MG
•330 DATA 9,20,8,9,13,8,9,19 EE
•340 DATA 12,9,4,12,15,7,1,20 BE
•350 DATA 5,4,15,20,4,18,25,0 MO
•360 DATA 25,5,19,15,12,4,15,9 FC
•370 DATA 12,15,1,11,20,5,1,19 IC
•380 DATA 21,14,15,14,5,21,19,5 EC
•390 DATA 18,5,4,14,15,20,19,8 MD
•400 DATA 5,23,9,14,18,9,16,18 CI
•410 DATA 15,2,20,15,16,20,1,7 FF
•420 DATA 20,8,5,15,21,18,15,21 BO
•430 DATA 20,18,21,2,16,9,14,1 BI
•440 DATA 14,4,1,14,20,2,9,7 KG
•450 DATA 2,9,14,8,15,23,11,9 BH
•460 DATA 20,10,21,7,10,15,25,8 IN
•470 DATA 9,16,4,5,14,4,1,25 JL
•480 DATA 8,1,13,8,1,4,7,15 KL
•490 DATA 20,10,1,23,9,3,5,12 EE
•500 DATA 1,16,12,5,4,8,21,7 CP
•510 DATA 2,21,20,2,21,19,3,1 GH
•520 DATA 20,3,1,18,4,15,7,8 NK
•530 DATA 5,14,6,12,25,13,1,20 PG
•540 DATA 16,15,20,18,1,25,19,15 IC
•550 DATA 14,20,15,14,20,9,5,19 DP
•560 DATA 9,14,25,15,21,23,1,24 DF
•570 DATA 18,1,7,14,21,20,18,21 PI
•580 DATA 7,19,21,13,1,19,11,1 OJ
•590 DATA 18,13,6,1,14,10,5,20 FI
•600 DATA 6,9,14,6,15,18,10,15 LP
•610 DATA 2,12,1,25,12,15,23,2 BA
•620 DATA 9,4,2,5,4,1,9,18 OC
•630 DATA 8,1,19,12,9,5,8,9 GC
•640 DATA 4,4,9,5,11,9,4,3 NH
•650 DATA 21,20,13,1,16,20,9,14 JA
•660 DATA 20,5,14,19,9,24,15,1 PJ
•670 DATA 20,14,5,20,16,9,7,0 JH
•680 DATA 18,21,20,20,1,2,18,9 BG
•690 DATA 7,16,5,14,16,5,1,14 HG
•700 DATA 9,16,12,1,4,6,9,24 HJ
•710 DATA 7,21,13,2,21,13,2,1 IK
•720 DATA 4,12,15,20,3,18,25,1 GO
•730 DATA 9,4,6,1,18,10,1,18 AM
•740 DATA 11,5,25,16,1,20,3,21 IF
•750 DATA 2,8,1,20,6,9,20,3 OM
•760 DATA 1,16,2,1,25,6,18,25 GE
•770 DATA 13,1,4,18,1,20,19,1 BH
•780 DATA 20,16,5,20,23,5,2,25 DN
•790 DATA 5,20,16,9,20,19,1,4 FP
•800 DATA 23,9,7,15,23,12,14,15 GA
•810 DATA 4,18,15,20,20,21,2,23 FP
•820 DATA 1,7,16,1,25,2,15,25 IF
•830 DATA 6,15,24,3,15,20,3,1 FI
•840 DATA 2,5,1,18,6,1,20,10 EA
•850 DATA 1,2,3,15,2,18,21,13 MJ
•860 DATA 13,15,2,18,9,13,18,15 LB
•870 DATA 23,23,9,20,14,1,7,20 PE
•880 DATA 15,23,23,5,4,19,1,25 HJ
•890 DATA 16,21,14,18,1,23,19,1 GB
•900 DATA 16,16,9,5,1,9,13,19 DN
•910 DATA 9,18,20,1,24,4,9,16 IA
•920 DATA 2,9,20,2,1,18,7,1 IN
•930 DATA 16,8,21,20,6,1,4,2 FE
•940 DATA 1,7,2,5,7,5,12,13 FI
•950 DATA 8,15,5,1,19,8,4,15 IB
•960 DATA 5,8,21,2,10,9,7,12 HN
•970 DATA 21,7,4,1,2,2,5,20 KM
•980 DATA 16,15,4,13,21,7,14,1 LP
•990 DATA 2,15,1,18,19,1,7,0 LP
•1000 DATA 20,21,7,20,1,16,19,5 NF
•1010 DATA 1,19,1,23,16,1,23,15 KI
•1020 DATA 18,5,23,5,20,19,12,25 BI
•1030 DATA 19,16,25,3,21,5,2,1 GC
•1040 DATA 14,3,15,14,11,5,7,10 NH
•1050 DATA 1,7,6,21,18,7,1,2 AN
•1060 DATA 10,15,7,3,15,4,1,9 LP
•1070 DATA 12,4,1,13,4,5,23,7 PL
•1080 DATA 21,20,7,15,4,12,1,7 HB
•1090 DATA 6,9,7,2,21,25,2,25 PH
•1100 DATA 5,10,15,20,5,1,20,6 DC
•1110 DATA 9,2,5,12,11,15,23,5 ML
•1120 DATA 19,15,2,18,15,4,18,1 JI
•1130 DATA 16,19,8,25,16,1,18,19 BM
•1140 DATA 15,4,16,18,25,15,1,6 OH
•1150 DATA 10,1,25,8,21,5,8,1 KG
•1160 DATA 7,11,9,14,3,1,13,5 IC
•1170 DATA 12,6,23,1,25,9,3,25 FP
•1180 DATA 9,22,25,8,5,13,1,18 CJ
•1190 DATA 11,6,9,18,1,23,5,7 OI
•1200 DATA 21,25,6,5,23,23,1,4 LO
•1210 DATA 12,1,24,13,1,18,16,18 HL
•1220 DATA 15,19,16,1,19,15,25,25 PK
•1230 DATA 1,16,15,4,5,18,1,13 MN
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 61 and 62 explain these codes and provide other essential information on entering *Ahoy!* programs. Refer to these pages **before** entering any programs!

```
•1240 DATA 22,5,20,22,15,23,19,21          EJ
•1250 DATA 5,16,5,7,13,5,20,20             EF
•1260 DATA 23,15,20,1,4,19,20,25           LM
•1270 DATA 9,13,16,18,25,5,19,21           HN
•1280 DATA 2,18,9,4,2,15,7,16              LL
•1290 DATA 21,2,16,15,24,16,5,23           KB
•1300 DATA 10,21,20,12,25,5,1,24           EE
•1310 DATA 5,1,12,5,3,15,7,0               PI
•1320 DATA 5,18,1,12,15,2,8,5              LO
•1330 DATA 24,9,18,5,4,9,14,1              BH
•1340 DATA 7,15,3,1,4,3,15,25              FC
•1350 DATA 3,21,4,4,25,5,7,15              NK
•1360 DATA 2,9,18,11,22,5,24,25            DO
•1370 DATA 1,13,26,9,16,20,15,7            DC
•1380 DATA 20,1,13,14,1,25,14,15           FF
•1390 DATA 18,19,15,24,16,12,25,16         NO
•1400 DATA 5,18,15,23,14,16,21,7           ED
•1410 DATA 23,15,5,8,21,13,12,1            DB
•1420 DATA 13,12,15,24,5,15,14,5           OG
•1430 DATA 7,15,4,15,14,1,23,12            OP
•1440 DATA 7,1,4,1,6,20,1,19               LE
•1450 DATA 16,6,12,21,7,5,12,12            JD
•1460 DATA 15,16,14,21,2,18,21,5           LM
•1470 DATA 19,5,24,19,15,16,20,8           OI
•1480 DATA 25,25,1,11,13,9,4,16            DD
•1490 DATA 21,19,14,9,12,19,21,16          FF
•1500 DATA 23,18,25,15,18,2,18,1           FG
•1510 DATA 8,20,15,13,25,5,1,21            BM
•1520 DATA 18,14,1,4,15,1,25,5             NL
•1530 DATA 4,21,15,3,21,18,9,15            IN
•1540 DATA 14,6,18,15,2,15,1,22            PE
•1550 DATA 9,5,7,14,21,19,15,23            KH
•1560 DATA 13,15,4,15,16,20,15,8           NM
•1570 DATA 13,18,15,5,1,16,20,1            KO
•1580 DATA 18,3,2,1,8,4,21,14              CL
•1590 DATA 8,5,18,10,9,2,21,7              GO
•1600 DATA 8,20,21,24,19,15,20,16          JC
•1610 DATA 1,12,23,1,19,14,9,20            MJ
•1620 DATA 8,9,5,9,12,11,21,13             DL
•1630 DATA 16,6,5,4,22,9,13,0              DH
•1640 DATA 1,12,16,1,21,11,2,15            CE
•1650 DATA 16,2,21,18,3,1,23,3             JN
•1660 DATA 1,25,3,15,19,3,15,24            HH
•1670 DATA 3,21,13,4,1,14,5,6              MN
•1680 DATA 20,5,13,21,5,18,7,6             KB
•1690 DATA 1,7,19,1,3,6,5,14               HH
•1700 DATA 6,5,25,6,5,26,6,9               HF
•1710 DATA 5,6,15,2,6,15,16,7              OP
•1720 DATA 1,18,8,1,23,8,5,23              MI
•1730 DATA 8,15,2,8,15,4,13,1              CF
•1740 DATA 23,13,5,23,13,8,15,13           LG
•1750 DATA 15,20,14,5,2,14,9,2             OK
•1760 DATA 15,2,9,15,12,5,15,22            AG
•1770 DATA 1,18,5,22,16,1,19,16            GH
•1780 DATA 15,9,16,25,24,18,5,13           HE
•1790 DATA 18,5,16,19,9,3,19,15            KG
•1800 DATA 12,12,5,9,20,1,23,20            BC
•1810 DATA 9,3,20,15,18,20,21,14           PF
•1820 DATA 22,9,1,1,12,2,23,1              NJ
•1830 DATA 14,13,9,12,23,5,14,23           LB
•1840 DATA 15,11,25,1,8,25,1,23            GJ
•1850 DATA 25,5,14,25,5,23,25,9            HC
•1860 DATA 16,2,18,1,15,6,20,21            II
•1870 DATA 13,16,2,5,25,12,5,1             DB
•1880 DATA 0,0,0,0,0,0,0,0                 KH
•1890 DATA 0,0,0,0,0,0,0,0                 KN
•1900 DATA 0,0,0,0,0,0,0,0                 JL
•1910 DATA 0,0,0,0,0,0,0,0                 MB
•1920 DATA 0,0,0,0,0,0,0,0                 MP
•1930 DATA 0,0,0,0,0,0,0,0                 LF
•1940 DATA 0,0,0,0,0,0,0,0                 OD
•1950 DATA 0,0,0,0,0,0,0,0                 OJ
```

SCREEN POCUS 64
FROM PAGE 52

BASIC LOADER

```
•10 SA=49152                                      FG
•20 FORI=SATOSA+200:READA:POKEI,A:CK=CK+A
 :NEXT                                            LC
•30 IFCK<>26102THENPRINT"ERROR IN DATA":S
 TOP                                              FL
•50 A=SA+6:B=INT(A/256):C=A-B*256:POKESA+
 1,C:POKESA+2,B                                   AJ
•60 A=SA+51:B=INT(A/256):C=A-B*256:POKESA
 +5,B:POKESA+4,C                                  MB
•70 A=SA+164:B=INT(A/256):C=A-B*256:POKES
 A+154,B:POKESA+153,C                             EH
•100 DATA76,6,192,76,51,192                       DO
•110 DATA169,0,141,54,3,141                       GA
•120 DATA55,3,141,56,3,141                        FG
•130 DATA57,3,169,234,141,40                      IG
•140 DATA3,169,249,141,14,212                     JL
•150 DATA169,238,141,15,212,169                   EK
•160 DATA0,141,24,212,169,129                     LI
•170 DATA141,18,212,169,160,141                   DF
•180 DATA136,2,96,162,0,169                       IE
•190 DATA4,133,252,134,253,134                    KL
•200 DATA251,169,160,133,254,165                  DF
•210 DATA1,41,254,133,1,173                       LM
•220 DATA27,212,168,177,251,209                   PL
•230 DATA253,240,54,177,253,145                   LI
•240 DATA251,162,0,189,54,3                       OB
•250 DATA240,7,232,224,4,144                      AJ
•260 DATA246,176,85,230,254,230                   HL
•270 DATA252,165,252,201,8,144                    AA
•280 DATA218,169,4,133,252,169                    BH
•290 DATA160,133,254,165,2,141                    FF
•300 DATA52,3,160,25,136,208                      ED
•310 DATA253,206,52,3,208,246                     JC
•320 DATA24,144,192,140,53,3                      FK
```

```
•330 DATA173,27,212,201,128,144          JN
•340 DATA5,169,200,24,144,2              BP
•350 DATA169,136,141,164,192,172         FK
•360 DATA53,3,177,251,209,253            JN
•370 DATA208,173,200,204,53,3            KG
•380 DATA208,244,165,252,56,233          IJ
•390 DATA4,168,169,1,153,54              HF
•400 DATA3,24,144,157,169,4              MO
•410 DATA141,136,2,169,237,141           NM
•420 DATA40,3,165,1,9,1                  PH
•430 DATA133,1,96                        LL
```

DEMO

```
•10 POKE53280,0:POKE53281,0:PRINT"[CLEAR]
 [c 7]";:POKE2,100                       ID
•14 DIMV$(24):V$(0)="[HOME]"             OJ
•15 FORI=1TO24:V$(I)=V$(I-1)+"[DOWN]":NEX
 T                                       JO
•16 B$="":FORI=1TO39:B$=B$+" ":NEXT:B$="[
 RVSON]"+B$                              NM
•20 FORI=1TO71:PRINT"SCREEN POCUS! ";:NEX
 T:SYS49152                              DK
•52 PRINT"[CLEAR]"V$(8);                 MI
•53 PRINTTAB(14)"[RVSON][14" "]"         EP
•55 PRINTTAB(14)"[RVSON][4" "]SCREEN[4" "
 ]"                                      DH
•56 PRINTTAB(14)"[RVSON][4" "]POCUS![4" "
 ]"                                      AD
•57 PRINTTAB(14)"[RVSON][14" "]"         BD
•58 PRINTTAB(14)"[RVSON][4" "]*DEMO*[4" "
 ]"                                      KL
•59 PRINTTAB(14)"[RVSON][14" "]"         AF
•60 PRINTV$(23)TAB(13)"PRESS ANY KEY[3"."
 ]"                                      NL
•65 FORI=1TO700:NEXT                     OD
•70 SYS49155                             PM
•90 GETA$:IFA$=""THEN90                  JE
•100 POKE2,1:SYS49152:PRINT"[CLEAR]";    BK
•120 SYS49155:SYS49152                   AB
•130 PRINT"[CLEAR][YELLOW]"V$(7)TAB(6)"FA
 DE SPEED MAY BE CONTROLLED!"            JD
•140 PRINTV$(10)TAB(6)"SCREENS MAY FADE O
 UT/IN"                                  DM
•150 PRINTV$(11)TAB(6)"SIMULTANEOUSLY!"  HG
•160 PRINTV$(14)TAB(6)"ALL FOR [RVSON] NE
 AT [RVSOFF] PRESENTATIONS!"             EO
•170 POKE53280,6:POKE53281,6:SYS49155    JO
•181 PRINTV$(23)TAB(12)"PRESS ANY KEY[3".
 "]"                                     KN
•182 GETA$:IFA$=""THEN182                CO
•190 X=1:FORJ=1TO101STEP50:POKE2,J:PRINT"
 [CLEAR]":SYS49152:PRINT"[CLEAR]";       HG
•200 FORI=1TO120:PRINT" SCREEN ";:NEXT   LP
•220 GOSUB300:SYS49155:SYS49152:PRINT"[CL
 EAR]";                                  OB
•230 FORI=1TO120:PRINT" POCUS  ";:NEXT   KN
•250 GOSUB300:SYS49155:SYS49152:PRINT"[CL
 EAR]";                                  NL
•260 FORI=1TO120:PRINT" MAGIC! ";:NEXT   MG
•270 GOSUB300:SYS49155:X=X+1:FORDY=1TO500
 :NEXTDY,J                               CL
•280 POKE2,70:SYS49152:PRINT"[CLEAR]";:FO
 RI=1TO23:PRINTB$:NEXT                   KF
•290 PRINTV$(10)TAB(7)"[RVSON]PRESS ANY K
 EY TO RESTART"                          IL
•292 SYS49155:SYS49152:PRINT"[CLEAR]"    EG
•295 GETA$:IFA$=""THEN295                IF
•296 POKE53280,0:POKE53281,0:SYS49155:RUN OM
•300 PRINTV$(12)TAB(16)"[RVSON]SPEED="MID
 $(STR$(J),2):RETURN                     KA
```

TRI WORDS

Continued from page 18

ADD are not allowed), if the letters are in the current grid, if the word has already been used, or if the word is a word at all. After passing all the tests, the word will be printed on your board on the left side of the list.

If you feel all possible words have been selected, or if you wish to quit, enter three "at" signs (@@@) to challenge the computer. The computer will try to guess one more word. If it succeeds, the computer wins. If it fails, the game ends in a tie. Of course, the computer can also inform you that it is stumped and will declare you the winner. The length of a game will vary depending on the 16 letters chosen, as well as the level you have selected.

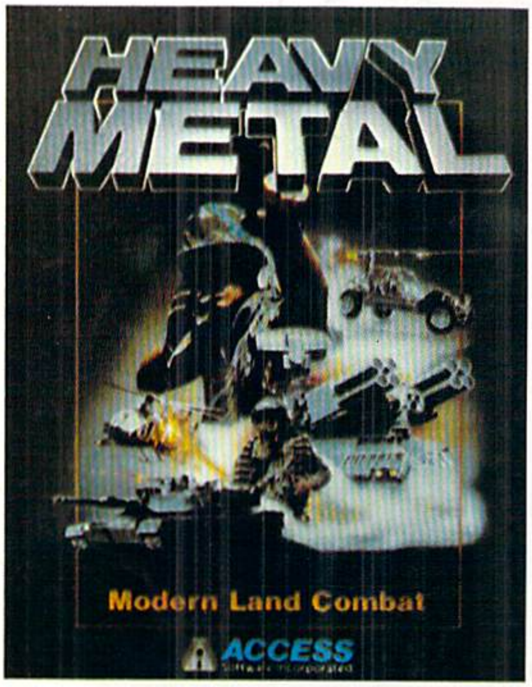
The game is challenging and can help you expand your vocabulary while providing hours of entertainment. If the computer selects a word you are not familiar with, use the opportunity to learn a new word by looking it up in the dictionary. ☐ *SEE PROGRAM LISTINGS ON PAGE 70*


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Time to power up your ADATS (Air Defense Anti Tank System) and start knocking down incoming MIG Fighters. Seems easy until they start coming in 6 or 8 at a time. Now you're in serious trouble. But don't forget, you're also the Company Commander. Charlie Company is on the horn and wants to know what to do. Attack? . . . Fall Back? . . . Just received word that your defense perimeters have been overrun and the General's on the Line. He wants to know what's going on up here???



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